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ABSTRACT

This manual is intended to accompany a videotape entitled "Tangible Symbol Systems." The manual summarizes techniques shown in the videotape, gives additional background and technical information, and supplies recordkeeping forms. It is aimed at teachers, parents, and others who work with individuals who have severe/multiple sensory disabilities, and possibly cognitive disabilities as well. Techniques are applicable with subjects of all ages. The focus of these techniques is communication through iconic, manipulable, permanent, and tactually identifiable symbols that can be selected or indicated through simple motor responses such as pointing or touching. Chapters cover such issues as how to construct tangible symbol systems, how to implement their use in functional routines, and how to plan short- and long-term communication programs that will ensure progress in their use. (PB)

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TANGIBLE SYMBOL SYSTEMS

Symbolic Communication for Individuals with Multisensory Impairments

by Charity Rowland, Ph.D.
and Philip Schweigert, M.Ed.

EC 230841

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by Charity Rowland, Ph.D.
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Charity Rowland, Ph. D., is a research scientist with the Oregon Research Institute, in Portland and Eugene, Oregon. Her training is in developmental and experimental psychology. As a graduate student, Dr. Rowland participated in the primate language project at the University of Oklahoma. Since then she has conducted extensive research and demonstration efforts on language acquisition and communication development.

Dr. Rowland has received a number of grants from the U. S. Department of Education to study communication by individuals with severe disabilities, including vision, hearing, and cognitive impairments and orthopaedic impairments. She has written extensively and conducted numerous workshops and symposia on this topic. Dr. Rowland's most recent research has been concerned with the acquisition of communication skills by children with dual sensory impairments.

Philip Schweigert, M.Ed., is a project coordinator with the Oregon Research Institute. Now in his thirteenth year in the field of special education, his current research is concerned with establishing and increasing communication skills in individuals with vision and hearing impairments. Previously, as a classroom teacher, he developed and implemented classroom services for and later chaired the Sensory/Motor Impaired Unit of the Portland public schools' Special Needs Program. He has conducted a number of professional workshops and in-service training programs dealing with linguistics and communication. Mr. Schweigert has served on local, county, and state advisory boards serving persons with severe disabilities.

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Purpose

This manual accompanies a videotape entitled "Tangible Symbol Systems." It is best to view the videotape before using this manual. The manual summarizes the techniques shown in the videotape, gives additional background and technical information, and supplies recordkeeping forms.

The program is for teachers, speech-language pathologists, other support staff, and parents who work with individuals who have severe/multiple sensory disabilities. The program was developed during a study of the use of tangible symbols by children and youths with dual sensory (vision and hearing) impairments. Most of these individuals had severe cognitive disabilities as well. The techniques are also suitable for individuals who do not have sensory impairments but who have severe communication deficits due to other disabilities.

Any individual who is not capable of making the transition from presymbolic communication (gestures) to abstract symbolic communication (formal language) might be a candidate for tangible symbols. Potential candidates are individuals with autism, severe mental retardation, severe sensory impairments, severe developmental disabilities, orthopaedic impairments, or a combination of these disabilities. The techniques are appropriate for all ages—including infants in the home environment, children and youth in educational settings, and adults in rehabilitation settings.

Introduction

Speech is only one of many ways to communicate; research on the development of communication in infants without disabilities has shown that parents and infants communicate with each other soon after the infant is born (Bates 1979; Bateson 1975; Bruner 1975; Kaye 1982; Lewis and Rosenblum 1977; Schaffer 1977). This knowledge has led to the understanding that individuals with severe communication deficits can learn to communicate using preverbal behaviors such as gestures and gross vocalizations. Many individuals who cannot use a formal language (such as speech or manual sign language) learn to communicate spontaneously by using gestures such as pointing, extending objects, or hand-guiding. Some individuals who don't learn on their own to use these gestures may be taught to use them (McLean, Snyder-McLean, Jacobs, and Rowland 1981; Stremel-Campbell, Johnson-Dorn, Clark-Guida, and Udell 1984).

Gestures are widely understood and are effective for communicating about the here and now, but they do not allow communication about specific entities or concepts not immediately present. For instance, we may point to or touch the food that we want to eat, but how do we communicate that we want a drink, if there is no cup or drinking fountain close by that we can point to or touch?

Normally developing children might pantomime the act of drinking from a cup if they didn't know the word *drink*. This would be an example of "natural" sign language—a symbolic gesture that represents the act of drinking. But this sort of symbolic gesture does not appear in many individuals who have vision and hearing impairments or severe cognitive impairments. Many of these individuals do not progress beyond the use of conventional gestures to the use of any sort of symbolic representation, be it a symbolic gesture or more conventional symbols such as spoken words or manual signs.

Many individuals who are unable to communicate through conventional symbols such as speech or manual signs can learn to use tangible symbols—objects or pictures that bear a concrete relationship to the visual or tactile properties of the entities they represent. Tangible symbols look like or feel like those entities. This program was developed as part of an investigation of communication training strategies for children and youth who have severe cognitive impairments and both vision and hearing impairments. The strategies would be equally applicable to older individuals and to individuals without sensory impairments who are not able to acquire speech or manual sign language.

A number of alternative symbol systems have been developed for use with nonspeaking clients. These have been reviewed by Musselwhite and St. Louis (1982), Schiefelbusch (1980), and Silverman (1980). Increasingly, nonspeech symbol systems have been used to stimulate communication by nonspeaking persons with severe disabilities, with generally encouraging results (Kiernan 1983; Lloyd and Karlan 1984). But most nonspeech symbol systems require rather high cognitive skills as well as good visual acuity. Examples include Blissymbolics (McNaughton and Kates 1980), Picsyms (Carlson and James 1980), and Rebus (Woodcock, Clark and Davies 1969), all of which use graphic representations. The NonSLIP program (Carrier and Peak 1975) uses three-dimensional plastic forms to train simple grammatical relationships. Though tactually discriminable, the NonSLIP symbols are completely abstract forms, with no perceptual relationship to their referents. Two- and three-dimensional symbols that relate more obviously to their referents might fill a need that the above systems have left unmet.

Van Dijk (1966-67) incorporates the use of objects as symbolic representations into his communication training techniques for children with dual sensory impairments. This program's use of tangible symbols is an outgrowth of van Dijk's work—interpreted by Stillman and Battle (1984)—which in turn is based upon the theories of Werner and Kaplan (1963).

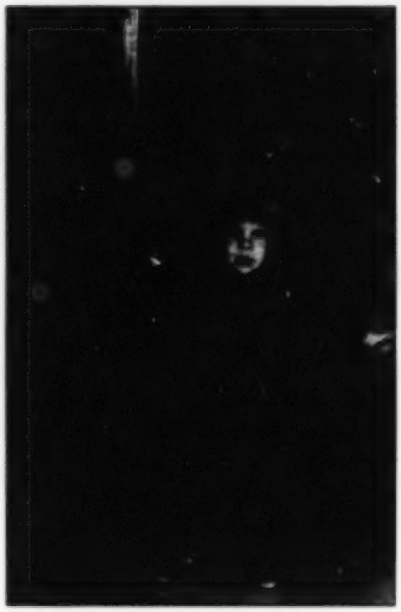
What Are Tangible Symbols?

Symbols represent or stand for other things, such as people, objects, places, activities, and concepts. Unlike gestures, symbols allow a person to refer to entities that are spatially distant (e.g., in another room) or temporally distant (e.g., occurring in the past or future).

Referents are what the symbols stand for or represent.

Abstract symbols are those that make up languages, such as speech, manual sign language, and printed language. Abstract symbols have an arbitrary relationship to referents—there is no obvious relationship between the symbol and the physical properties of the referent. They generally do not look like, sound like, or feel like the referent that they stand for. Other types of abstract symbols include Braille and Blissymbols.

Concrete symbols *do* bear an obvious physical relationship to their referents. The symbolic gestures that children sometimes use (or that adults use when playing charades) are one type of concrete symbol. These gestures are *iconic*—they visually mimic the shape or movement of the referent. For instance, the child below seems to be using a symbolic gesture to say *big* or *ball*.



A symbolic gesture—a type of concrete symbol.

Similarly, a child might make a buzzing sound to indicate a bumblebee, mimicking the auditory properties (the sound) of the referent. This sound would be another sort of concrete symbol—an auditory symbol. Sometimes auditory and gestural symbols are combined; for instance, when a child indicates the smoke rising from her father's pipe by making an upward spiraling motion with her hand and accompanying this symbolic gesture with a "whooshing" sound.

Tangible symbols are a subset of concrete symbols. They may be either three-dimensional (objects) or two-dimensional (pictures). They have the following properties:

1. They are *iconic*. They bear a clear perceptual relationship to a referent and thus make lower demands on cognitive abilities than do abstract symbols.
2. Because they are *permanent*, they make lower demands on the user's memory than do speech and signs. Since tangible symbols need only be recognized out of a permanent display of symbols, they require only recognition memory, a lower level of cognitive skill than recall memory.
3. They are *manipulable*. They may be picked up and handed to someone, or placed next to a referent.
4. They may be selected or indicated through a *simple motor response* such as touching or pointing, placing low demands on the user's fine motor abilities.
5. Three-dimensional tangible symbols are *tactually discriminable*, so that an individual without sight may distinguish between them.

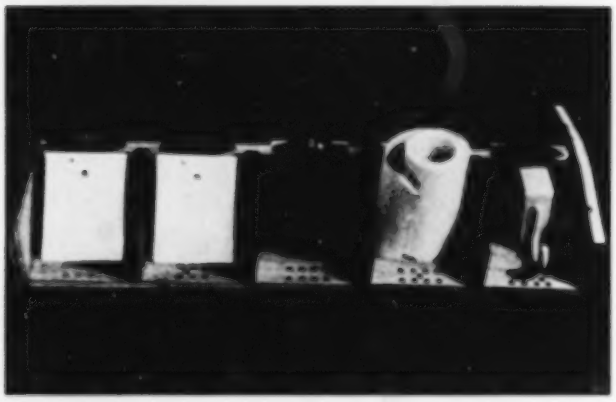
The figure on the next page shows where tangible symbols fit into a progression of communication from presymbolic or gestural communication to the use of abstract symbols or language. For some, tangible symbols may help bridge the gap between gestural communication and formal language systems. For others, tangible symbols may represent the ultimate level of communicative competence.

Tangible symbols do have some disadvantages. They are often bulky and not very portable. They are also very unconventional; since few people use them, it is sometimes difficult for others to understand that they constitute a real communication system.

Level of Communication	Means of Communication
Presymbolic	Primitive and conventional gestures
Concrete Symbolic	Symbolic gestures Tangible symbols Objects (Three-dimensional) Pictures (Two-dimensional)
Abstract Symbolic	Speech Sign language Printed language Braille Abstract shapes (e.g., NonSLIP) Abstract graphics (e.g., Blissymbols)

The most common use of objects as symbols has been within calendar systems, concrete calendars (see Umholtz and Rudin 1981), or anticipation shelves, which originated in interpretations of van Dijk's work with deaf-blind children (see Stillman and Battle 1984). These systems use objects to represent the major activities of the learner's day. Prior to each activity, the learner is taken to the calendar or shelf to collect an object used in the activity. The object helps the learner anticipate the coming event.

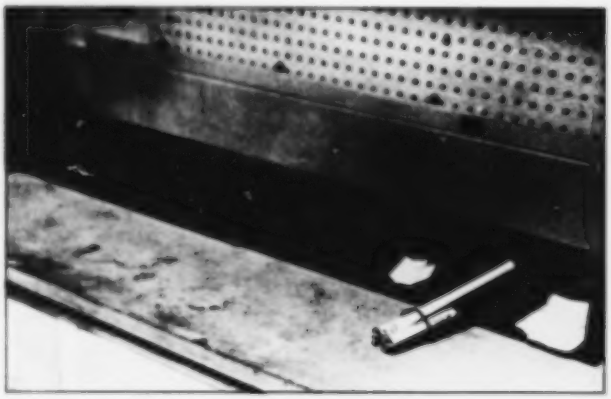
Here is a typical calendar box. The box has partitions for each activity, and the three-dimensional symbols are arranged from left to right in the sequence of the day's activities. The learner knows what comes next by retrieving the object that symbolizes the activity from the next compartment. When an activity is completed, the symbol is removed or covered up. This calendar box has flaps to cover the compartments for completed activities.



A calendar box

At the beginning of the day, you may construct the day's calendar with the learner and converse about the planned activities as the symbols are placed in their compartments. This is a rich context for communication; the major purpose of most calendar systems, though, is for scheduling or time management.

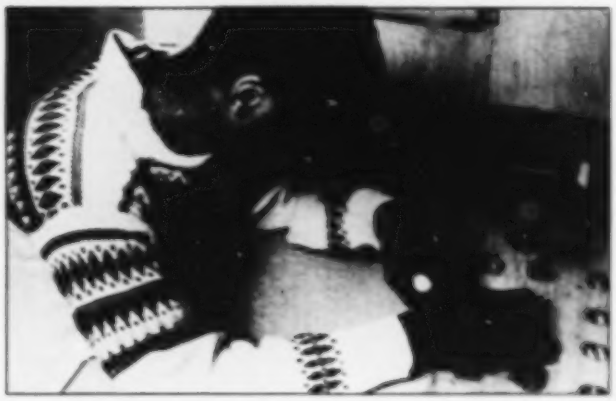
Here, Tony uses a calendar box to obtain information about the next activity in his schedule. Note that the symbols are not used for communication, which must involve another person.



Tony's 10-compartment stationary calendar box

Tony takes the object from the next full compartment.

Holding the symbol, he travels to the area for the activity represented by the symbol . . .



. . . and begins work on the task.

This program will show you how to use tangible symbols for both expressive and receptive communication throughout the day. Some uses will incorporate the calendar box concept; others will not. In all cases, the use of the symbols will involve another person and will therefore result in communication. Here, since Tony directs his use of the symbol to his teacher, his calendar system becomes a focal point for *expressive* communication.

Tony signals to his teacher that he has finished his activity . . .

. . . and together they go to the calendar box, where Tony places the symbol for the next activity into her hand.

The teacher signs yes, right into his hands to confirm his selection . . .

. . . and Tony sets off to the appropriate activity area.

Here are three more examples of individuals using tangible symbols for *expressive* communication-communicating something to their teachers:

Bryan requests a specific food item from his teacher by extending a picture of that item.

During free play, Adam points to the symbol of the toy he desires.

Now he touches the toy that corresponds to the symbol he selected, his teacher signs yes *. . .*

. . . and Adam begins his play time.

At work, David is occasionally allowed to choose the next task. His supervisor signs What work? *into his hands . . .*

. . . and helps David tactually scan the array of symbols for work options.

David selects the symbol for the desired task and extends it to his supervisor to communicate that choice.

Tangible symbols may also be used for *receptive* communication. Here are two examples of individuals using tangible symbols for *receptive* communication—receiving information from their teachers.

The teacher hands Adam the symbol for play . . .

. . . and signs play time.

Chris's teacher points to a picture of the game she wants.

Chris retrieves the corresponding toy and they play together.

Who Needs Tangible Symbols?

For Expressive Communication

Three major indicators suggest that a learner might use tangible symbols for expressive communication.

1. The learner must have enough intentional fine or gross motor behavior to indicate or select a symbol. Some possibilities are picking up a symbol, pointing, eye pointing, and touching.
2. The learner must have some intentional communication—be able to use some means (such as pointing, extending objects, tugging, or hand guiding) to intentionally control the behavior of another person. An individual with no means of presymbolic communication is not ready for symbolic communication. For instance, if an individual will not extend an actual cup to request more to drink, do not expect the person to extend a symbol for a cup to make the request. In most cases, the person should learn to use some form of gestural communication before advancing to symbolic communication.
3. The individual should *not* have the cognitive ability to communicate using abstract symbols. Do not ask a person who can use a higher level of communication with reasonable efficiency to use a lower level. The exception to this rule is when the environment does not support the individual's use of a higher level of communication. For instance, a person may be able to use some sign language but others in the community may not know sign language. You might teach the individual to use picture symbols if you thought others in the community would respond more readily to pictures. The picture symbols would not replace the sign language, but would let the person communicate with a wider audience.

For Receptive Communication

For receptive communication (when the learner receives information), you may start using symbols prior to the emergence of intentional expressive communication skills. Use the symbols in association with specific activities or materials, so that when the individual is ready to use them expressively, the symbol-to-referent correspondence has already been established.

Constructing Tangible Symbol Systems

Let's step back now and look at the components of a tangible symbol system.

Referents

A *referent* is what a symbol stands for or represents. In determining the vocabulary you want a learner to use, you determine what referents you will create tangible symbols for. At first, train symbols that are highly functional, highly motivating, and that will be used regularly and frequently enough that the learner acquires them as rapidly as possible.

The first referents you target should be those that the learner has a large number of opportunities to use every day. Learning is likely to be more rapid if the referent is also an item that strongly motivates the learner; many individuals acquire symbols for less preferred items or activities more slowly than they do for more highly preferred items. The more reinforcing the referent, the greater is the likelihood that the learner will eventually *initiate* using the symbol, which is the ultimate goal of communication training.

There are two major contexts for finding potential referents for tangible symbols: within activities and during the transition between activities.

Within Activities. Activities contain many items that are used repeatedly and/or are highly motivating. For instance, during snacks or meals, potential referents are preferred foods that can be offered in small portions so the learner requests them often. In a vocational context, logical referents would be the materials that are used repeatedly and that may be presented one at a time or in small quantities. Virtually any object-oriented activity has opportunities to use symbols to represent the materials used within it.

Certain materials or equipment inherently foster communicative exchanges, since the actions they are associated with are more social than solitary. These materials make especially good vocabulary. For object-mediated activities that require the help of another person, the learner may use a symbol to request the specific object, and then use a gesture to ask for *help* with or *more* of the object. For example,

the individual may use a *swing* symbol to request to use the swing, and then use a gesture to request another push.

Between Activities. While changing activities, tangible symbols may represent the activities to which the learner is transitioning. Since the number of opportunities for use is of paramount importance when you first introduce symbols, use tangible symbols to represent activities that happen *frequently* (such as toileting) and *regularly* (such as meals). It is best if the activities happen in separate areas; the physical location of the activity is an additional cue to help distinguish between one activity and another and helps the learner associate the symbol with the activity. Some good candidates for representation through tangible symbols are snack time, recess, toileting, lunch time, and going home.

Other Categories of Referents. Here are some useful referents that don't fit either of the above categories.

Finished. This lets the individual indicate that the person is finished with an activity or with certain materials used within an activity. It also lets you tell the learner that the activity is over or that it is time to move on to new materials.

The Wild Card. Some individuals who use calendar systems for time management are severely disturbed by changes in the regular schedule. For them, you may try a *wild card* to stand for anything new for which there is no symbol. For instance, if school pictures are to be taken today, insert the wild card into the calendar system. The card doesn't specify exactly what is about to occur, but at least the learner knows that something unusual is about to happen.

People. It is useful for individuals to be able to refer to the important people in their environment. Items of personal identification—such as jewelry or a watch band—can identify a particular person. One learner used a tube of distinctively scented lip balm as a symbol for a teacher who wore it regularly.

Types of Symbols (Levels of Representation)

You have a number of options in terms of the type of tangible symbol you decide to use. The first decision is whether to use three-dimensional symbols (objects) or two-dimensional symbols (pictures). The learner without sight must use three-dimensional symbols, since they are tactually discriminable. Use two-dimensional symbols if the learner has adequate vision and is able to understand the relationship between a picture and its referent. Some individuals may eventually progress from the use of tangible symbols to abstract symbol systems, such as manual sign language. Others seem to require one or more of the unique features of tangible symbols—such as their permanence or their manipulability—to communicate.

Three-dimensional symbols are tactually discriminable objects. The relationships between symbols and referents, or *levels of representation*, range from very concrete (a shoelace to represent *shoes*) to relatively abstract (an abstract shape to represent the concept *finished*). Here are examples of several types of three-dimensional symbols.

Identical Objects. Sometimes an actual object used within an activity represents that activity or object. For instance, a few raisins glued to a square of cardboard might be the symbol for *raisins*.

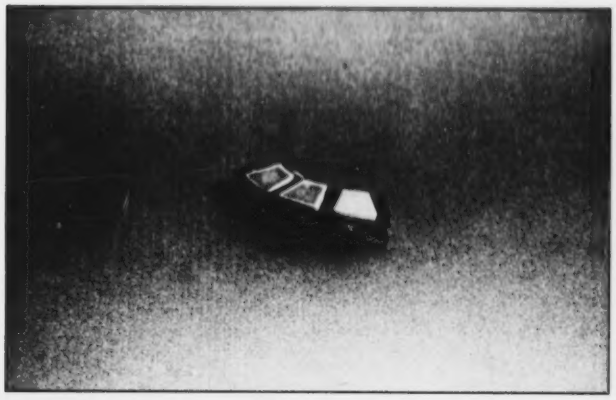
A few raisins glued to a card make a symbol for raisins.

Joe's cracker symbol is a piece of graham cracker taped to a card.

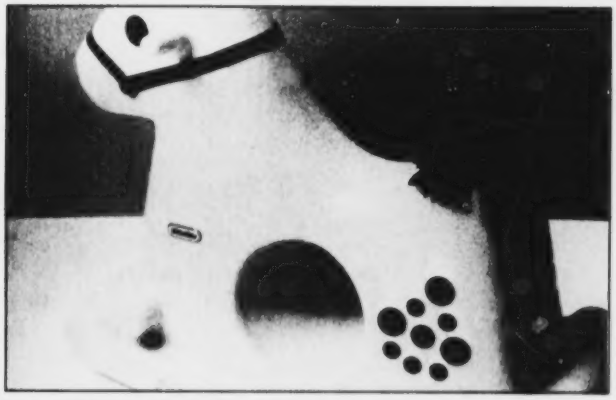
Partial or Associated Objects. Sometimes parts of objects or objects associated with activities can serve as symbols. For instance, you might use a lunch ticket

(an *associated* object) to represent *lunchtime* in the school cafeteria. A handgrip from a bicycle (a *partial* object) can represent *bicycle*.

Representing this musical toy . . .



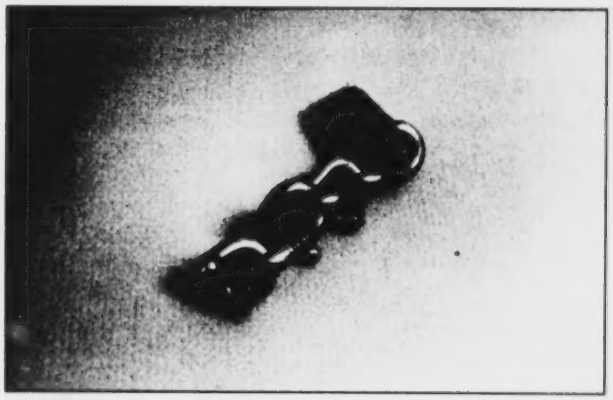
. . . are some teeth from another one.



This rocking horse with a yarn tail . . .

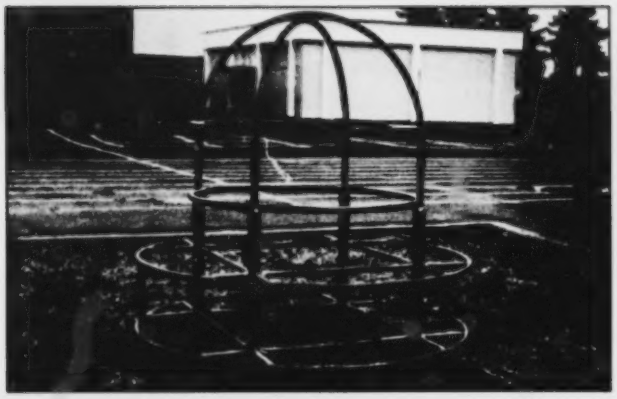
. . . is represented by a hank of yarn similar to the tail.

The symbol for the tire swing . . .

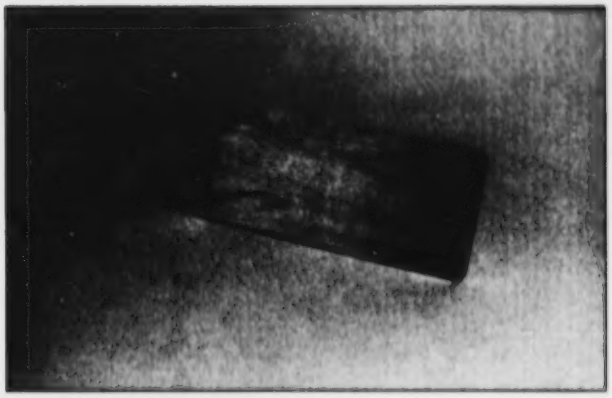


. . . is several links of chain.

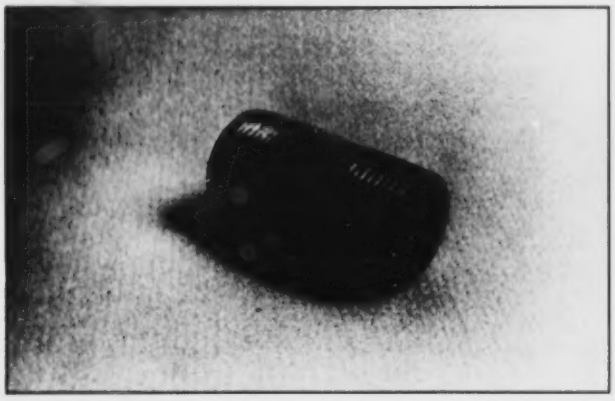
17



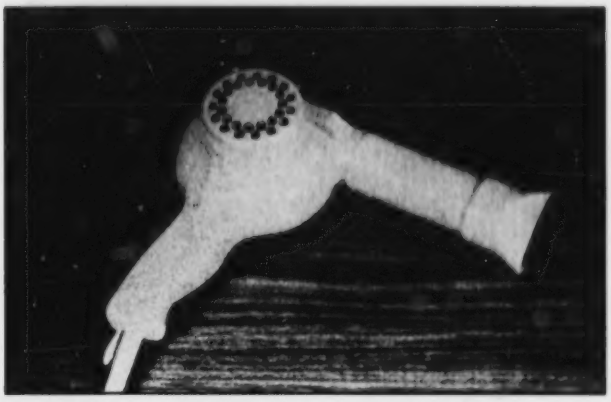
The symbol for the jungle gym . . .



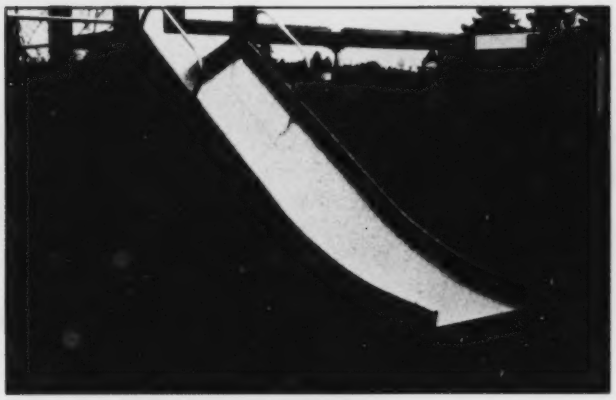
. . . a smooth, shiny piece of metal.



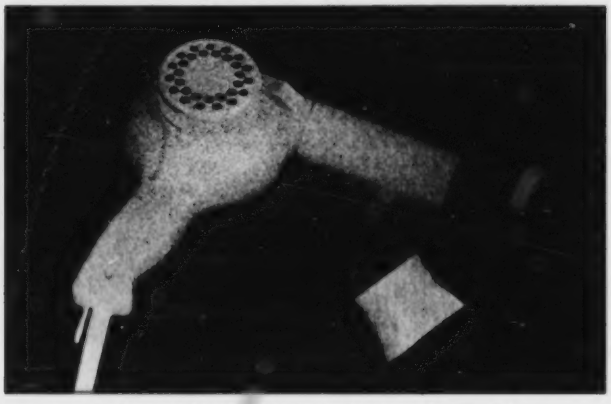
. . . is a piece of metal pipe.



The hair dryer is represented by . . .



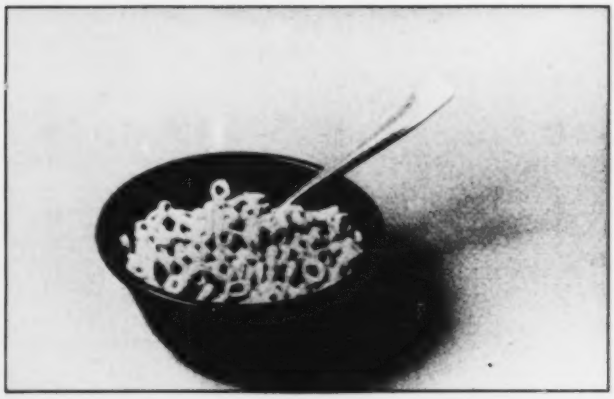
The symbol for the playground slide is . . .



. . . an attachment that is placed on the dryer before it is turned on.

Hanging up or retrieving a coat . . .

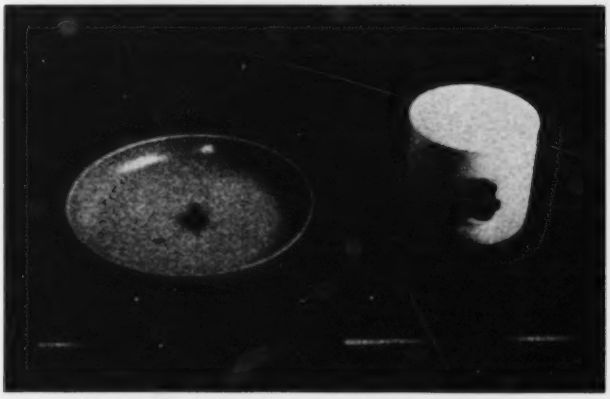
. . . is represented by a coat hook.



Mealtime . . .

. . . is represented by a spoon.

Borders. Symbols that bear a very strong resemblance to their referents (such as identical, partial, or associated objects) can be difficult for the learner to distinguish from the referent. To emphasize the distinction between symbol and referent, you may need to attach the symbols to some sort of border, such as a cardboard backing or a square of rigid plastic. The border makes it clear that the symbol is not for functional use, but is to be used only for communication.

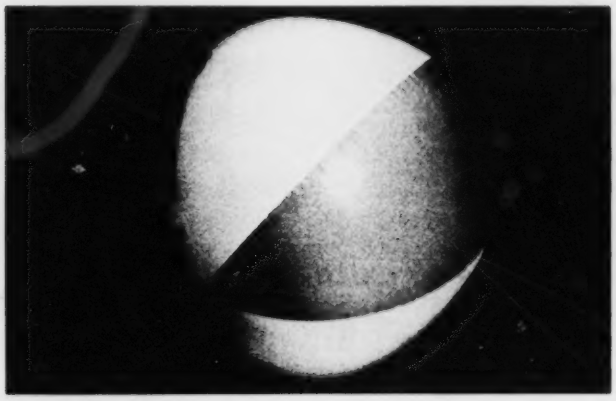


The cup and plate (symbols for eat *and* drink *) are attached to clear plastic bases.*

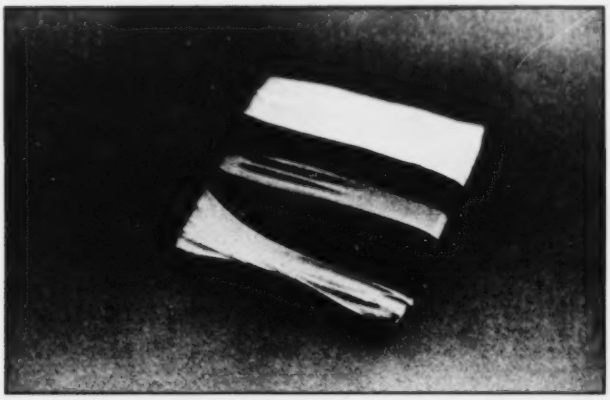
This toy symbol (a part of the toy) is attached to a cardboard base.

Do *not* use the same symbol to represent both an activity and an object used within the activity (for instance, a milk carton to represent both *lunchtime* and *milk). The double meaning can be very confusing.*

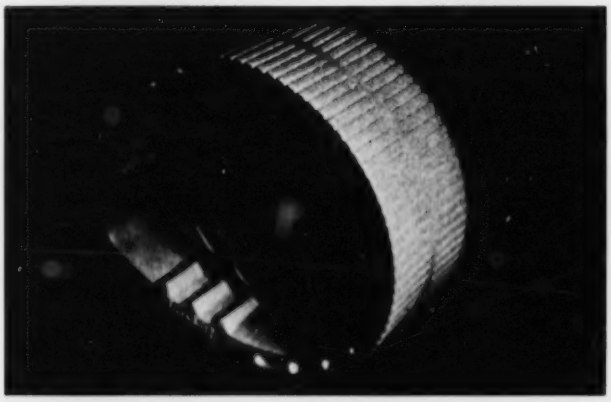
One or Two Shared Features. The symbols discussed to this point bear a very obvious physical relationship to their referents, since they share a number of perceptual features, such as shape, size, color, and texture. The fewer perceptual features that a symbol shares with its referent, the more abstract it is. A more abstract level of representation involves symbols that share only one or two features with their referents, *depending upon the sensory abilities of the learner.* Here are examples of symbols that share only one or two perceptual features with their referents.



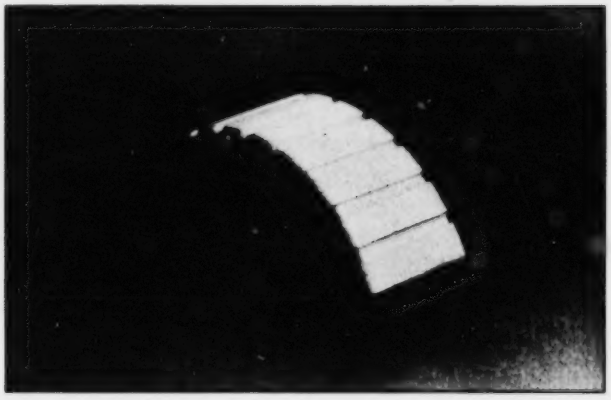
The therapy ball, with its smooth, multicolored features . . .



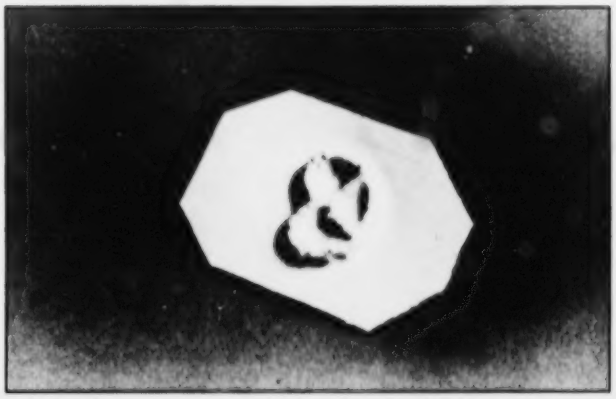
. . . is represented by a card covered with smooth multicolored rubber strips. The symbol shares color and texture with its referent, but differs in shape and size.



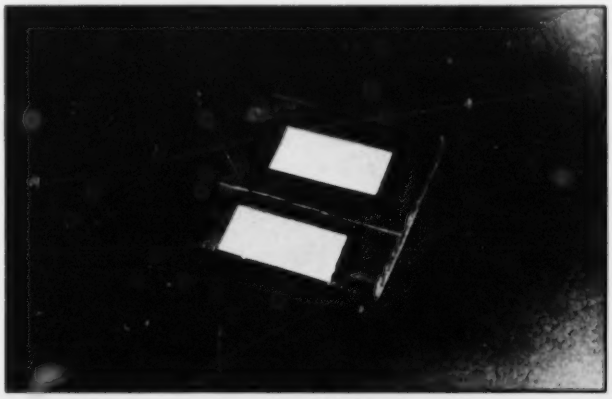
The oval rocking apparatus with its ribbed surface . . .



. . . is represented by a form that is similar in color and texture.



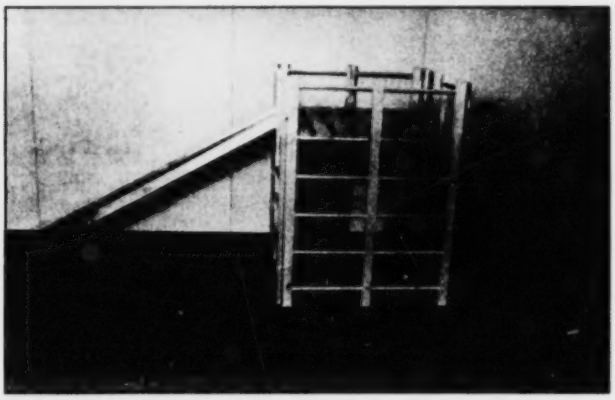
This is the thermoform impression of a pretzel. It shares size and shape—but not color or texture—with an actual pretzel. (A thermoform is a raised impression molded from thin plastic, often used to reproduce Brailled text).



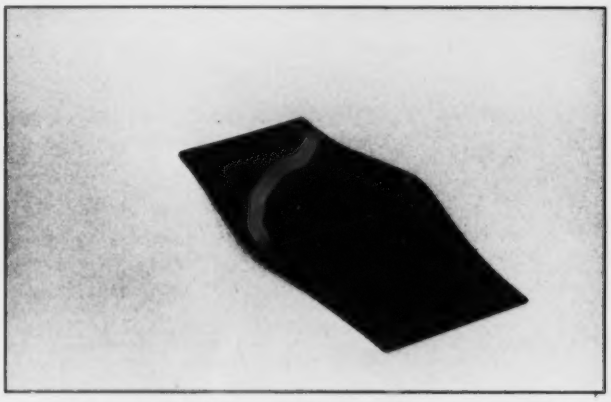
Its symbol is a small square of wood with the same tape applied to it.

Artificial Symbols. Some referents—such as locations, activities that do not involve particular objects, or equipment without removable pieces—do not lend themselves easily to representation through tangible symbols. In other instances, the logical symbol for a referent may be so similar to one already in use that it would be difficult for the learner to distinguish one from the other. In such cases, you can artificially create a symbol, training the symbol-to-referent association by permanently displaying the symbol at the activity site or on the equipment. For instance . . .

The worktable was made tactually unique by taping a place mat to it . . .

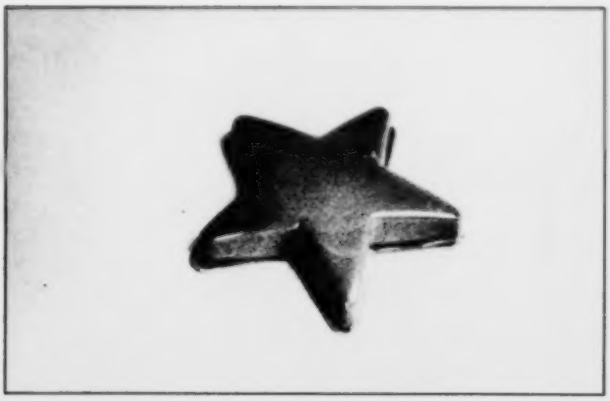


Strips of white nonskid tape were applied to the steps of the indoor slide.

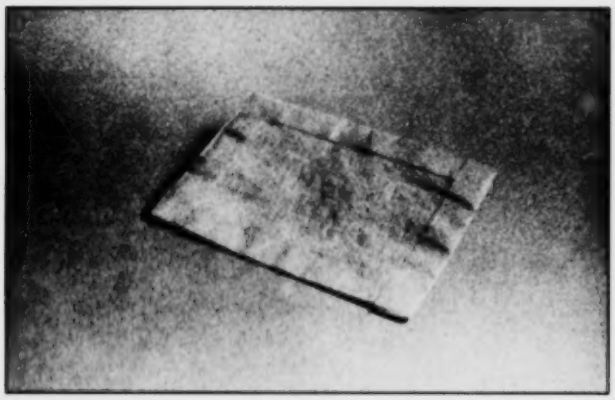


. . . and is represented by a smaller piece of the same material.

A piece of white fabric was affixed to the seat of the rocking chair, which the learners feel before they sit in it.

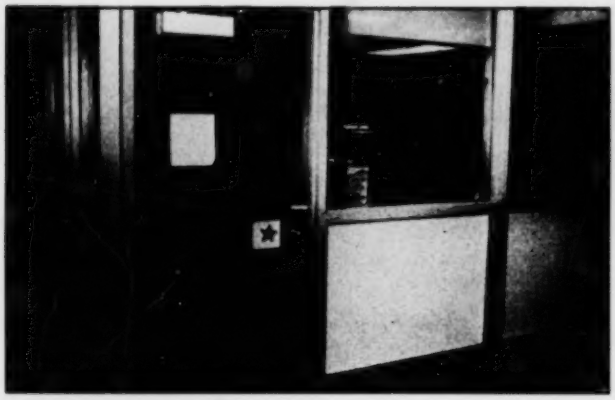


. . . and a second star symbol that could be placed over the one on the door became the symbol for office.

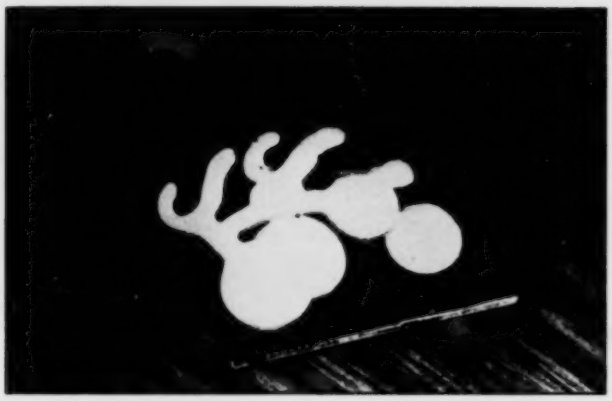


A small piece of the same fabric is used as the symbol for the chair.

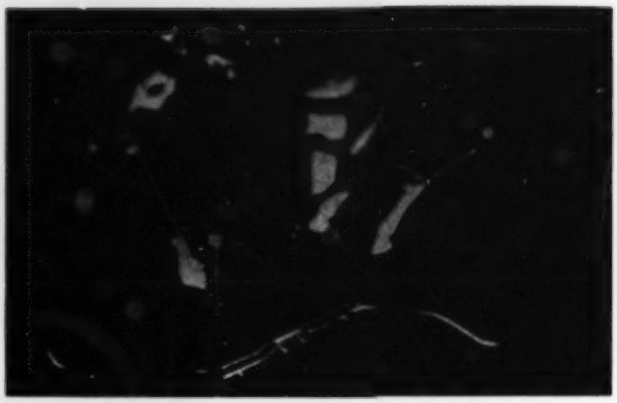
A template of a tricycle shape was placed on the playroom door and . . .



A hollow plastic star was attached next to the handle of the door to the office . . .

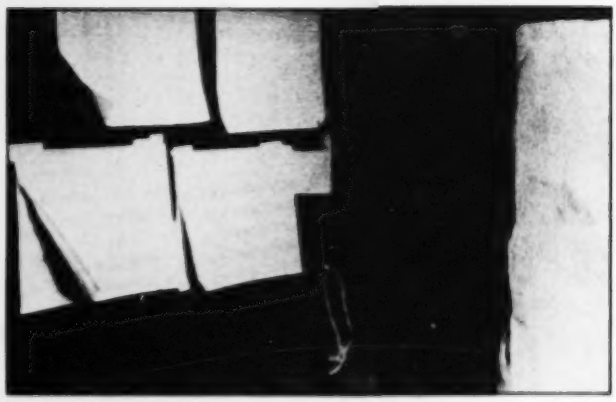


. . . a tricycle shape that symbolizes playroom *could be placed into the cutout on the door, accentuating the association between the symbol and referent.*



Sheepskin was wrapped around the rocking horse handle . . .

. . . and rocking horse *is represented by a dowel wrapped in sheepskin.*

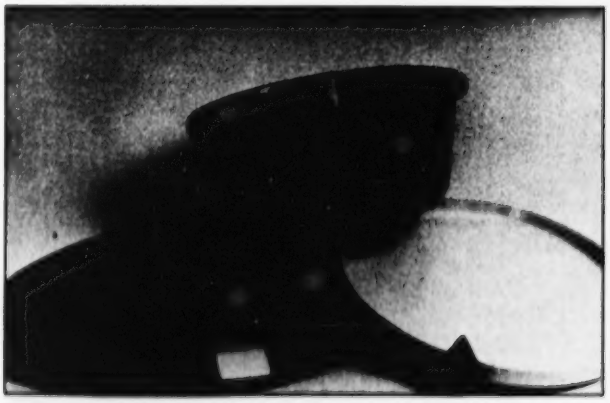


A piece of rope was tied to the cupboard latch . . .

. . . and a similar piece of rope serves as the symbol for that particular cupboard.

Container Symbols. If an activity involves a large variety of materials or frequently changing materials, it may not be practical to have symbols at hand for all possible materials. For instance, it would be difficult to have symbols ready for all the foods that might be served by the school cafeteria. One solution is to use symbols for the *containers* that you use consistently to present the food or materials. These may be pictures of the containers or, as in the example below, three-dimensional symbols. Show the learner (visually or tactually) what choices are within the containers and then require the learner to use a symbol to indicate the container for the desired item. This way, a few symbols can be used to select a potentially unlimited set of items.

Here is a set of three serving dishes used to contain the meat, vegetable, and dessert offerings served every day by the cafeteria. The learner uses symbols identical to those attached to the dishes to request the foods, which are served out of the containers.

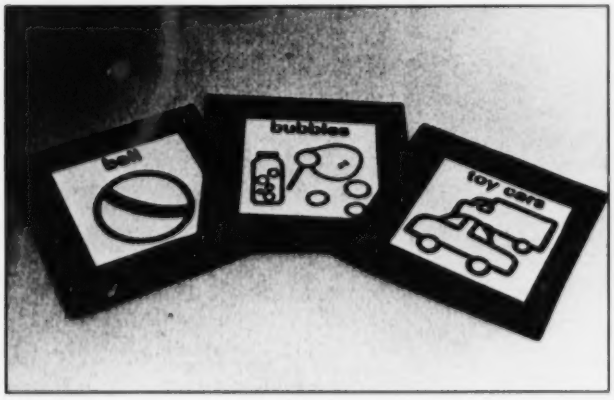


The small square, circle, and triangle are permanently attached to the serving dishes. Matching shapes are symbols for the containers.

Some ready-made miniatures (such as dollhouse furniture, other doll accessories, and necklace and bracelet charms) can be used as three-dimensional symbols. These are very convenient if the learner has the visual and cognitive abilities necessary to understand their meaning. There are three drawbacks to using miniatures:

1. Individuals without sight will probably not be able to perceive the relationship between a miniature and the full-size object. For instance, the sensation of sitting in a chair—felt chiefly on the posterior—has no similarity to the sensation of feeling a miniature doll's chair with one's fingers.
2. Even individuals with good vision require relatively advanced cognitive skills to perceive the relationship between miniature and full-size versions of an object, particularly if the size difference is very great.
3. Ready-made miniatures are available for only a rather restricted domain of potential referents.

Two-dimensional Symbols. Two-dimensional symbols are *pictures* of referents. They may be photographs, colored line drawings, or black-and-white line drawings. Sets of generic photographs and line drawings are commercially available; you can also produce your own.



Line drawings

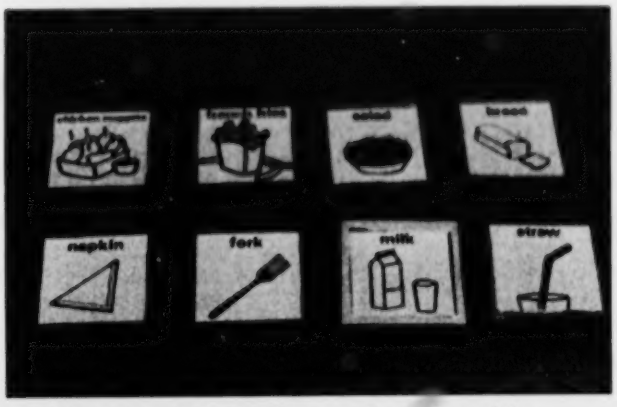
Photographs

Determining Which Type of Symbol to Use. The symbols to be used by any learner should be: (a) perceptible and discriminable by the learner; (b) as abstract in terms of level of representation as the learner can understand; and (c) as portable as possible.

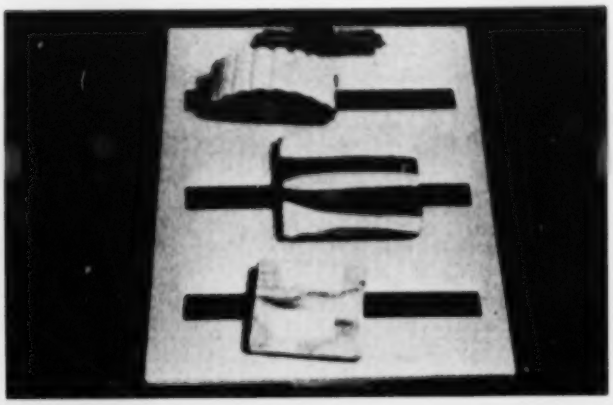
It is often difficult to determine which type of symbol to start with. First guesses are often incorrect; an individual's abilities can be surprising, once you start probing the person's ability to associate symbols with referents. A standardized assessment may not yield accurate information regarding a learner's symbolic abilities; often, competence differs from performance, which might be an artifact of history. The Tangible Symbols Pretest (see Appendix A) will help with the initial decision. This is simply a format for testing a learner's ability to match symbols to objects. If necessary, use the pretest to structure your initial probes to decide on the type of symbol to start with.

Presenting Arrays of Symbols

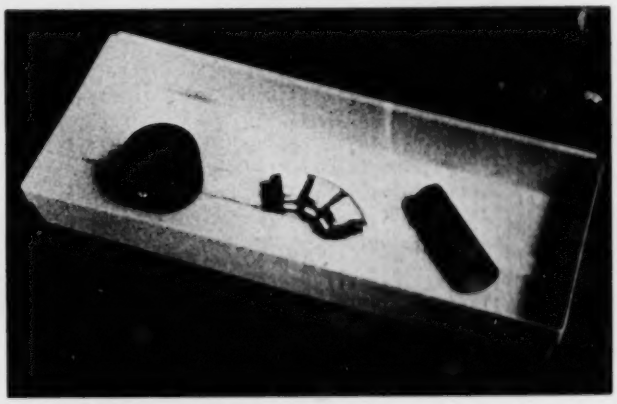
Here are some options for presenting symbols, to be used within and between activities.



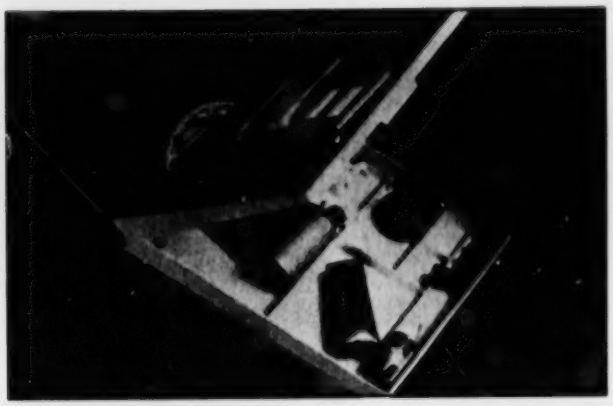
Symbols may simply be placed on a surface in front of the learner . . .



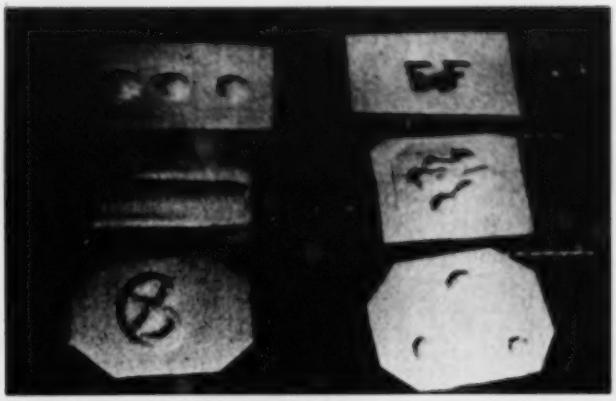
Velcro strips on a clipboard help to secure these three-dimensional symbols for presentation in a play activity that involves a lot of movement.



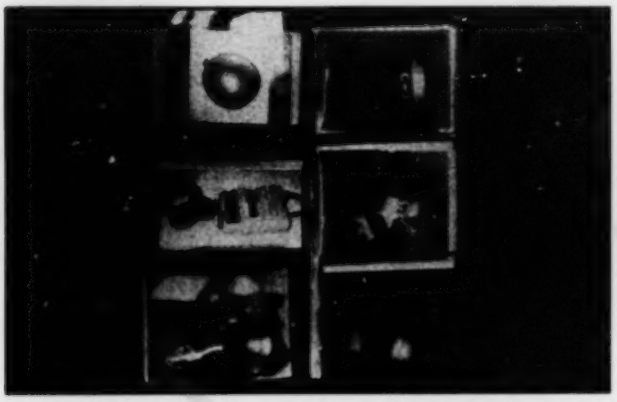
. . . or placed in a shallow tray, so the learner knows where the array of symbols begins and ends.



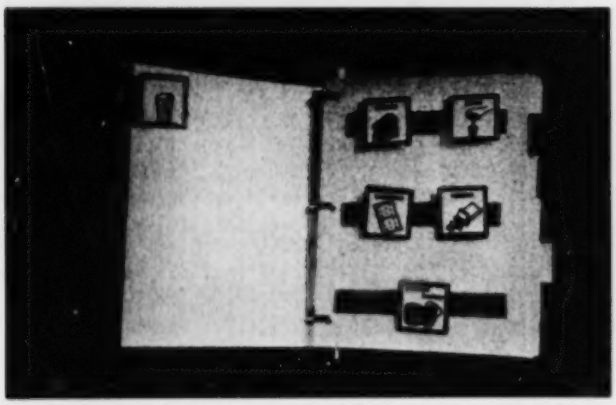
The compartment provides storage for symbols not in use at the moment.



Thermoform symbols for the vocabulary pertinent to a specific activity are presented on this page, with string to mark the division between each symbol.

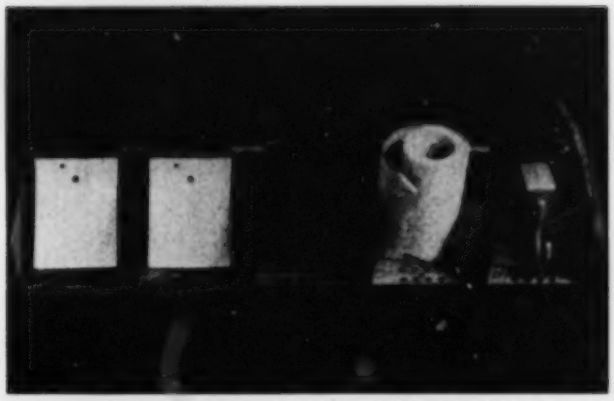


The picture vocabulary for a particular activity is organized within individual booklets, accentuating the limit of the symbol array.

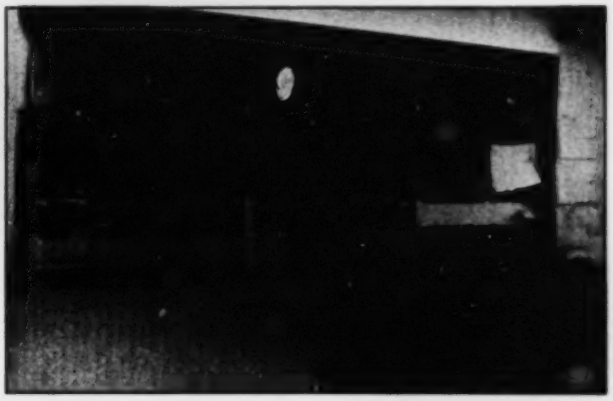


This communication book presents the learner's entire vocabulary. The activity symbol appears on the left-hand page, opposite the symbols used within that activity. Tabs between each section are color-coded to match the background color of the activity symbol.

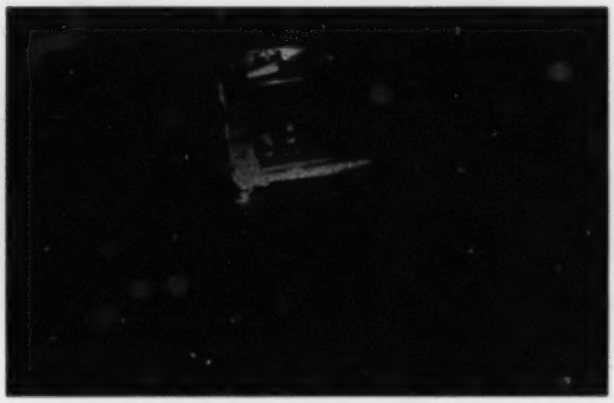
Between Activities



This calendar box is used to present three-dimensional symbols. As each activity is completed, the symbol in the compartment is covered by a flap.

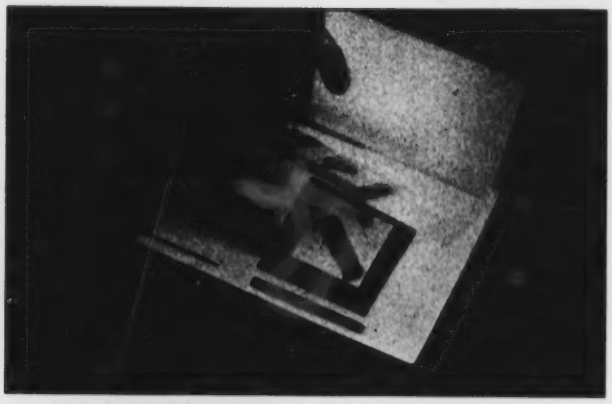


This calendar system consists of individual picture communication booklets for each of the day's activities.

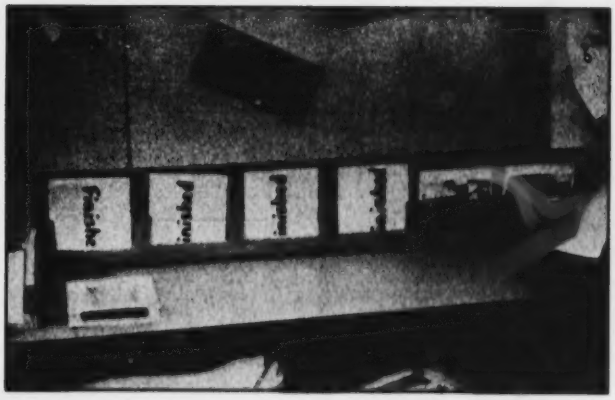


The front of each booklet has a picture representing the activity. . .

. . . while inside the booklet are pictures for each item used in that activity.



. . . and the picture vocabulary for that activity is inside.



This is another calendar system with individual booklets of pictures for each activity. When an activity is finished, the booklet is turned over and stored.

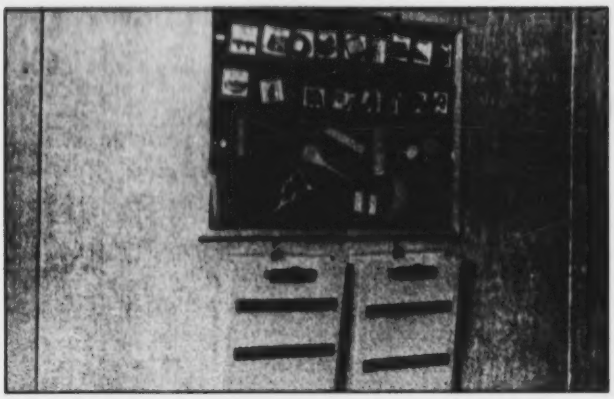
Finished *is printed on the back of the booklet to indicate that the activity is over.*

Each booklet cover has a picture of the activity on it . . .

Symbols for completed activities are often stored in a *finished* box that is kept next to the calendar system. The box lets the learner communicate about an activity that is not currently in the schedule by retrieving the relevant symbol from it. Whether or not to comply with the requested change in schedule is your decision, but at least the learner has the opportunity to communicate the request.

Permanent Symbol Arrays. Whether in the classroom, residence, or vocational setting, it is very useful to have permanent arrays of symbols at each activity area, with a common set of symbols for use by all tangible symbol users. Here is a permanent symbol array mounted in a school playroom.

On the bulletin board are stored the three- and two-dimensional symbols for all the playroom equipment as well as the clipboards that are used to carry and present the symbols. If all learners use the same symbols and if they are permanently available, it is more likely that staff members will remember to use them and that learners will start to initiate using them.



This bulletin board provides a permanent array of all tangible symbols used in the playroom and a place to hang the clipboards used to carry and present the symbols.

Selecting or Indicating Response

Another important consideration is the *selecting* or *indicating* response that the learner will use. The targeted response will depend on the learner's fine motor and visual abilities as well as the learner's ability to evoke the attention of another person. For instance, if an individual merely points to a symbol without first evoking attention (through eye contact, tapping, etc.), then the attempt to communicate might be unsuccessful. But, if the individual gives the symbol to another person, the action would evoke attention as well as indicate a symbol.

The targeted indicating response will dictate such variables as the size of the symbol, whether the symbol is permanently affixed to the array, and whether the array is portable or stationary. Here are some response options for indicating a choice of symbols.

After gaining the teacher's attention, Bryan indicates his choice of activity by touching the symbol.

Joe requests a particular snack food by extending the symbol for that item to the teacher. In the same move, he evokes her attention.

Lateach's symbols are attached to the board with Velcro. She indicates her choice by removing the symbol from the array and giving it to the teacher.

Chris labels the object he has selected by pointing to the corresponding symbol from the photo array.

Some individuals show a need or desire not only to indicate the chosen symbol but to *reject* the symbols that are not chosen. When presented with an array of symbols, the person may select the symbol for the desired object or activity and then want to push away the symbols for the rejected objects or activities. The procedure can be very confusing for the trainer if the same behavior is used for both selecting and rejecting symbols, so it is important that the learner use *different* behaviors. For instance, the person might give you the selected symbol and push the other symbols to the side or put them in a box.

Size of the Symbol Array

The Tangible Symbols Pretest should give you an idea of how many symbols the learner is capable of scanning and discriminating between at first. If a learner can already discriminate and select from an array of five symbols, start with an array of that size. Gradually increase the learner's vocabulary by adding more symbols. Many individuals start by learning to use only one symbol at a time and progress gradually to larger arrays, as outlined below.

1. **One-symbol array.** With the referent present, offer the learner only one symbol at a time. Require the learner to grasp, point to, or otherwise select the symbol. This teaches the required response (pointing, giving, touching), but not necessarily the meaning of the symbol. That is, the individual may learn the correct motor response, but since you always provide the correct symbol, there is no reason to learn that any particular symbol is associated with any particular referent. You may introduce several different symbols this way, always presented one at a time. Many individuals begin to understand the symbol-to-referent correspondence at this stage, but their comprehension of symbols cannot be tested until the next stage of training.
2. **Two-symbol array.** Once performance reaches criterion with the one-symbol array, introduce one additional symbol, so the individual has to discriminate between two symbols. This is the stage at which you can ascertain the learner's comprehension of the one-to-one correspondence between symbol and referent. (See pages 34 through 37 for procedures to test comprehension.)
3. **Larger arrays.** Once the two-symbol display is mastered to criterion, gradually increase the size of the array, up to the learner's capacity to scan and discriminate between symbols.

Embedding Symbol Use into Functional Routines

Receptive and expressive communication training should be embedded into functional routines throughout the learner's day. In this chapter are illustrations of teachers and students using tangible symbols as part of their daily routines. Goossens and Crain (1986) and Musselwhite (1986) provide many additional suggestions for using symbols in a wide variety of contexts.

Receptive Communication

Throughout the day, use tangible symbols to communicate information to individuals, just as you would use speech or sign language. At lunchtime, show the symbol for *milk* as you ask if the learner wants milk, or to announce that you are going to pour some more milk, or simply to comment on what the learner is drinking. During a vocational task, ask the learner to retrieve the necessary materials by presenting the symbol for the materials. Accompany your use of tangible symbols with the speech you would normally use or with any sign language the individual understands. Here are some examples of receptive communication:

Bryan's teacher used one of his symbols to ask him for a piece of carrot.

During snack time, Joe's teacher shows him the symbol for cracker *and he gives her the corresponding food item.*

In the free-play area, Adam's teacher hands him his three-dimensional symbol for play. . .

. . . *and signs* play time.

Expressive Communication

When discussing the expressive use of tangible symbols, it is helpful to describe the use of symbols during the transition *between* activities separately from the use of symbols *within* activities.

Between-Activity Sequence. Transitioning from one activity to another offers a rich context for using tangible symbols. Up to six steps are needed to take the learner from the termination of one activity through communication about the next activity. Here are the six steps of the between-activity sequence, with examples of behaviors that a learner might use at each step.

Examples of Learner's Behavior

1. INDICATE TERMINATION OF ACTIVITY
   Raises hand
   Rings buzzer
   Gives symbol for completed activity to teacher
2. ACCESS SYMBOL ARRAY
   Walks to calendar box
   Raises hand to request array
   Teacher brings array to learner
3. STORE SYMBOL FOR TERMINATED ACTIVITY
   Hands symbol to teacher
   Puts symbol in *finished* box
   Replaces symbol in array
4. SELECT SYMBOL
   Picks up symbol
   Points to symbol
   Touches symbol
5. DISPLAY SYMBOL
   Gives symbol to teacher
   Shows symbol to teacher
   Gazes at teacher or taps teacher's arm while pointing to symbol
6. COMPREHEND SYMBOL
   Goes to appropriate area for activity
   Shows positive or negative emotion depending upon preference for activity
   Retrieves materials needed for the activity

The *display* step is critical because without it, no communication occurs. If a learner merely selects the symbol and fails to involve another person by displaying it, then the symbol is not being used to communicate.

Here is an example of a learner using all six steps of the between-activity sequence:

Tony first signals for attention by ringing his bell.

When his request is acknowledged, he indicates termination of the current activity by extending the symbol for the completed task to his teacher.

He travels independently to his calendar system to gain access to the symbol array . . .

. . . and stores the symbol for the terminated activity by placing it in the finished *box next to the calendar.*

. . . and displays the symbol to his teacher.

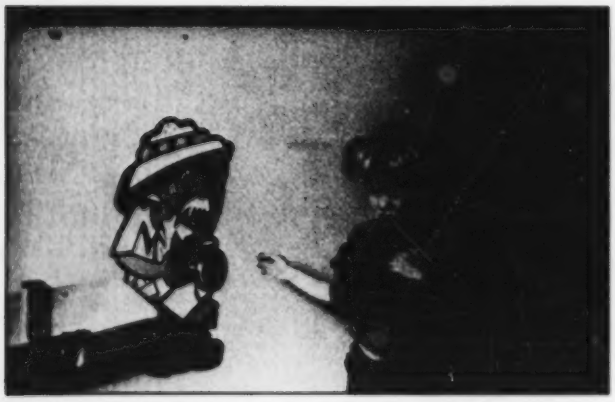
Here Tony scans the array of symbols, selects the symbol for the next activity . . .

The teacher confirms his selection by signing yes into his hand . . .

. . . and Tony demonstrates that he comprehends the symbol by traveling independently to the appropriate area.

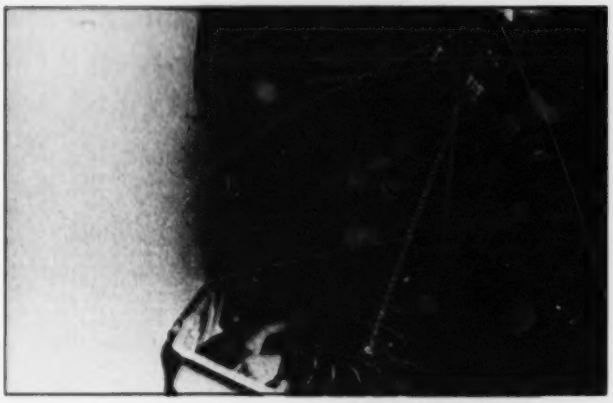
Most individuals, particularly in the initial stages of symbol acquisition, do not use all six steps of the between-activities sequence. Note that among the following examples, most of the learners do not use all six steps.

Example 1



Brandon and his teacher trail the wall to access the array of activity symbols.

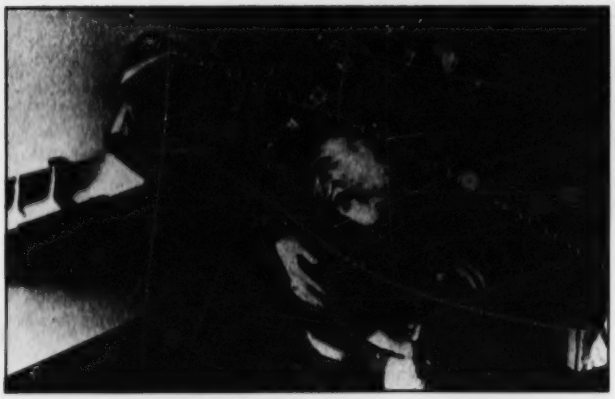
The array is permanently attached to the wall. It serves as a reference point, to which Brandon returns between activities.



To select the symbol, Brandon tactually scans the array, then locates and grasps the single activity symbol (here, a piece of fabric).

He removes the symbol and is helped to display it to his teacher . . .

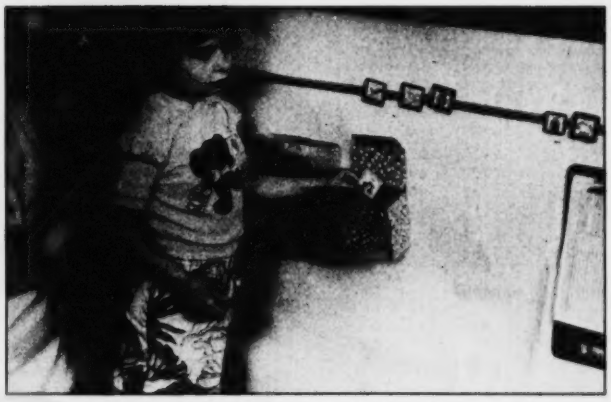
. . . who then helps him place it in his pouch, leaving his hands free for mobility. At this point, the teacher notes any indication that Brandon comprehends the symbol, such as an anticipatory response for the upcoming activity.



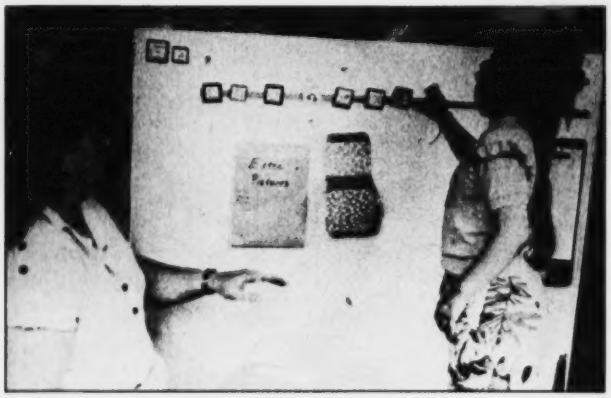
Brandon and his teacher then travel to the appropriate area and he tactually examines the upholstered chair, reinforcing the relationship between symbol and referent.

Example 2

Sarah requests termination of the current activity by handing the finished card to her teacher.

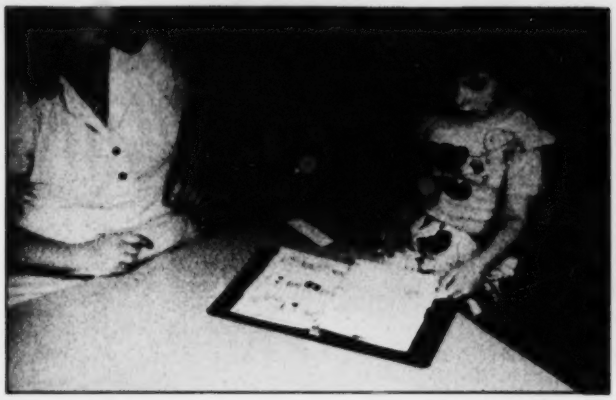


She then accesses the symbol array and stores the symbol for the terminated activity in the finished box.



Sarah selects a symbol from her calendar, . . .

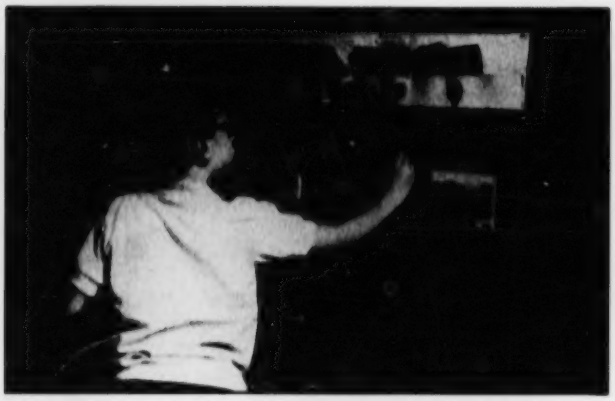
. . . displays the symbol to her teacher, who confirms her request, . . .



. . . and shows that she comprehends the symbol by traveling to the correct area.

. . . and displays it to his teacher.

Example 3



At his sequential array of activity booklets, Bryan stores the symbol for the activity he has just completed.

She confirms his selection, signing yes, eat.

He then selects the next symbol in the array . . .

Bryan then demonstrates that he comprehends the symbol by traveling to the appropriate area.

Restricted mobility may deny a learner independent access to the array of activity symbols. In some cases, you may have to bring the activity symbols to the learner. In other cases, lead the learner to the activity area and then present the activity symbols—in effect, requiring the learner to label the area, as in this example:

When Matt's symbol comprehension is assessed, mobility problems are eliminated by conducting the symbol selection for the playroom activity at the playroom door. Here Matt selects the corresponding symbol from an array of three symbols (demonstrating that he comprehends the symbol) . . .

. . . and displays it to his teacher, while making eye contact with her.

He further demonstrates his understanding of the symbol by matching it to the identical ring (an artificial symbol) on the doorknob.

A learner who comprehends the correspondence between symbol and referent may take the initiative to request an unscheduled activity; what appears to be an incorrect response may in fact be the learner's request for a change in schedule. Deny the request if the activity is clearly inappropriate. You may want to grant it, though, if it is for *bathroom* or for an activity that can feasibly be completed at that time.

Between-Activities Data Form. It is important for two reasons that you carefully track the acquisition of symbols. First, it is essential that the adults in all of the learner's environments (school, home, and work) use consistent cues and know exactly what responses to expect from the learner. For this reason, procedures must be *in writing* and *posted*.

Second, evaluation of the learner's progress must be based on actual data. On the next page is a sample data sheet to record the cues and responses for the steps that a learner uses during transitions between activities. This data sheet allows you to track performance for *each* activity symbol used. It is useful to analyze the learner's performance on a symbol-by-symbol basis, so you can discern differential

performance for more- and less-preferred symbols and referents. The trainer's cue to prompt the learner's behavior is specified for each step the learner uses. (No cues are used if independent behavior is targeted.) The response expected from the learner is also specified at each step. The activity symbols are listed across the top.

A simple scoring system would be to enter a "+" when the expected response occurs and a "–" when it does not. Or you might use a more complex scoring system to track types of errors by the learner or the level of assistance required for a correct response. A reproducible blank data sheet is included in Appendix B.

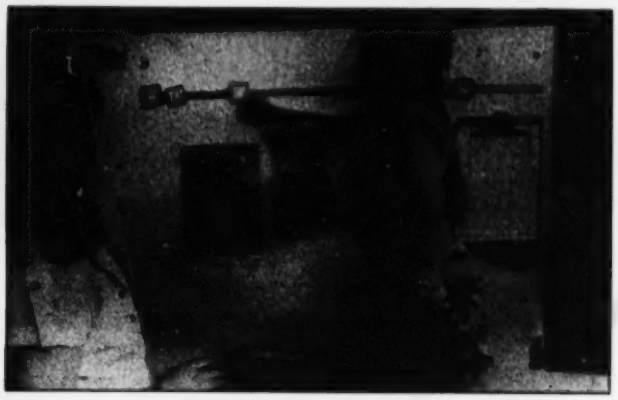
Sample
Between-Activities Data Sheet

Student Jimmy
Date 10-14 Tester Marian A.

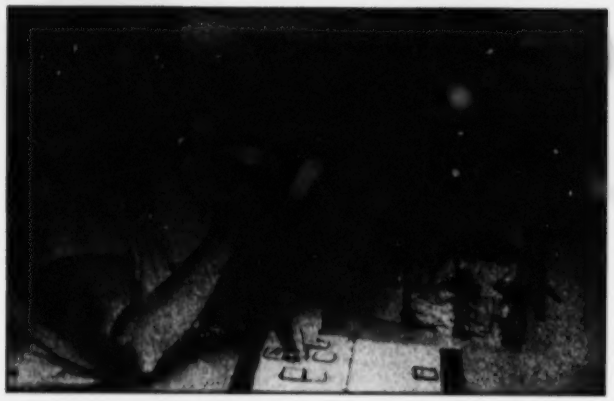
	Symbols: Locker	Restroom	P.E.	Work Area I	Break	Work Area II	Library	Lunch	Community	Locker	Bus				
1. INDICATE TERMINATION of activity Cue: (independent) Response: Rings bugger for attention and extends symbol for completed activity.															
2. ACCESS SYMBOL array Cue: Teacher confirms "Yes, finished." Response: Travels independently to array of activity symbols.															
3. STORE SYMBOL for terminated activity Cue: (independent) Response: Places symbol for completed activity in "finished" box.															
4. SELECT SYMBOL Cue: Teacher asks "What's next?" Response: Picks up next symbol in array.															
5. DISPLAY SYMBOL Cue: Teacher holds out hand. Response: Gives symbol to trainer.															
6. COMPREHEND SYMBOL Cue: Teacher confirms "Go to (activity)." Response: Travels directly to appropriate area for activity.															

Planning the Daily Calendar. There are many chances to communicate as you set up the activity calendar at the beginning of each day. You can sort through the activity symbols together and converse about the planned activities as the symbols are placed in their compartments. You can ask the learner to label activities using the symbols; for some time slots, you might offer choices of activities when feasible. Once a symbol has been placed in the sequence, you or the learner might use the learner's symbol system to indicate specific materials or people associated with each activity.

While planning their day at the calendar, Sarah's teacher asks what's next?



Sarah selects the symbol for the next activity and places it in sequence on the calendar.



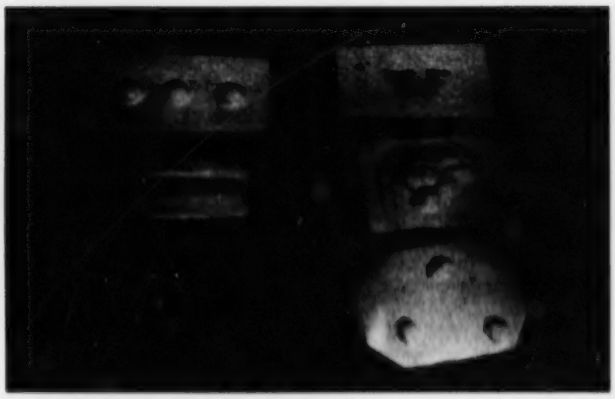
Then they can discuss that activity further, using the symbols associated with it.

Within-Activity Sequence. Activities offer multiple opportunities to use each symbol if you offer numerous choices of materials, allow short turns at activities, or supply small portions of reinforcing items. Here are the three major steps involved in using symbols within activities, with examples of learner's behaviors that might be associated with each step:

Examples of Learner's Behavior

1. SELECT SYMBOL
   Picks up symbol
   Points to symbol
   Touches symbol
2. DISPLAY SYMBOL
   Gives symbol to you
   Shows symbol to you
   Establishes eye contact with you while pointing to symbol
   Taps you and points to symbol
3. COMPREHEND SYMBOL
   Selects materials that correspond to symbol
   Protests if you give materials that don't correspond to symbol
   Selects symbol that corresponds to materials that learner has already chosen

Once again, the *display* step is essential. If the individual omits it, then no communication has occurred, since the learner has not involved another person in the use of the symbol. Here, a learner demonstrates the three steps of the expressive communication sequence within an activity.

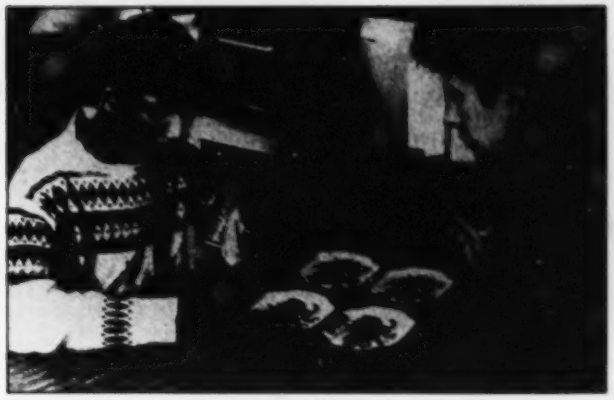


At snacktime, Tony is given a page of thermoform symbols for the available snack foods.

Tony scans the symbol array, selects a symbol, . . .

. . . and displays it to his teacher.

The teacher signs yes into his hand to confirm his request.



Tony then indicates that he comprehends the symbol by selecting the food that corresponds with it.

Comprehension Check. The comprehension check may be accomplished in one of two ways:

1. The learner may choose a symbol from an array of symbols and then choose the corresponding item or activity. If the learner chooses the wrong referent, introduce a correction procedure or begin a new trial.
2. The learner may choose the desired item or activity from an array of actual referents and *then* choose the corresponding symbol from an array of symbols. If the student chooses the wrong symbol, introduce a correction procedure or begin a new trial. Here are examples of this format:

Example 1

At snacktime, Joe's teacher presents three food items for Joe to choose from.

Joe indicates his choice of graham cracker by touching it and making eye contact with his teacher.

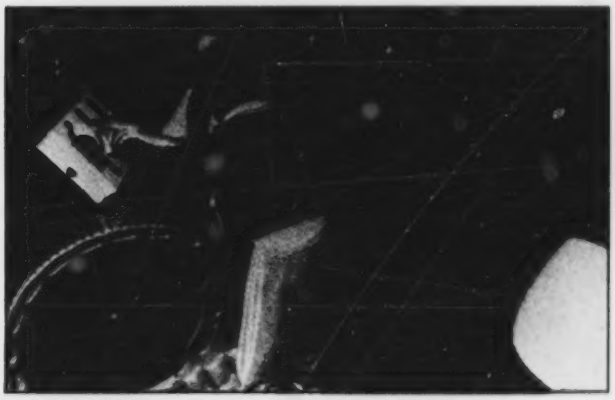
With the crackers still present, Joe must now label his choice by selecting the corresponding symbol from the two-symbol array. The comprehension check is part of the symbol selection since, once he has indicated what food he wants, there is only one correct symbol.

Joe then displays the symbol to his teacher.

Example 2

In the playroom, the teacher helps Lateach tactually explore each object in the choice array.

Lateach then indicates her choice by pushing away the undesired item and physically orienting toward the desired one.



Now Lateach must label the chosen object. Her teacher helps her tactually explore each of the symbols in the array.

Lateach must select the symbol that corresponds to the chosen item, showing that she comprehends its meaning.

Then she displays the symbol to her teacher . . .

. . . and they play together with the chosen item.

Periodically during that interaction, the teacher stops the activity to give Lateach the opportunity to terminate (by pushing the item away) or to request more . . .

. . . by taking the teacher's hand and placing it on the item.

. . . and helps Brandon select and display the symbol.

Example 3

Brandon and his teacher tactually explore three toys in the playroom. Once he indicates his preference, . . .

After performing these steps correctly, Brandon and his teacher can play with the ball.

. . . the teacher presents a single symbol array . . .

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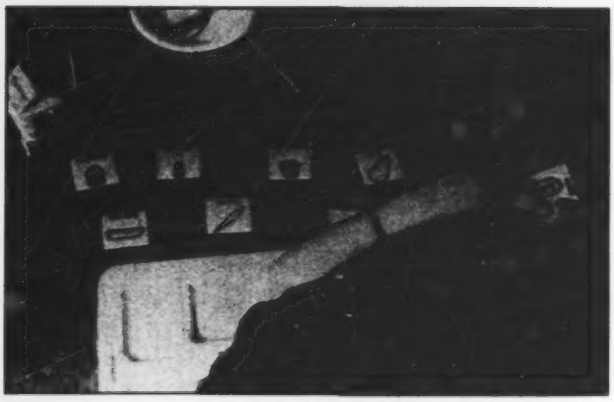
There is no need for a comprehension check—except as an occasional probe—once you are sure that the learner comprehends the meaning of the symbol. This sequence, for instance, omits the comprehension check.

Bryan taps his teacher to get her attention.



He then selects and displays the symbol for milk *by handing it to her, . . .*

. . . and she pours him a glass.

Data Form. On the next page is a sample data sheet on which to specify procedures and record data on the three-step expressive communication sequence. Use the bottom of the form to specify the exact cues and responses you and the learner are to use at each step. Across the top, specify the exact symbols used in each activity. You can evaluate the learner's performance across multiple trials for each symbol, using a different data sheet for each activity. A reproducible blank data sheet is included in Appendix B.

Sample
Within-Activities Data Sheet

Student Jimmy
Activity Free-Play
Date 10-14 Tester Marian A.

	STEP / SYMBOL	Building Blocks	Doll house	Truck	Ball											
TRIAL 1	SELECT															
	DISPLAY															
	COMPREHEND															
TRIAL 2	SELECT															
	DISPLAY															
	COMPREHEND															
TRIAL 3	SELECT															
	DISPLAY															
	COMPREHEND															
TRIAL 4	SELECT															
	DISPLAY															
	COMPREHEND															
TRIAL 5	SELECT															
	DISPLAY															
	COMPREHEND															

KEY SELECT symbol Cue Teacher signs "What want?" and assists student to tactually scan array of symbols
Response Student grasps and picks up one symbol

DISPLAY symbol Cue (independent)
Response Student extends symbol to teacher

COMPREHEND symbol Cue Teacher signs "What?" and assists student to tactually scan array of toys
Response Student touches toy corresponding to selected symbol and maintains touch

Programming for Progress

It is essential that you plan communication programming for both short-range and long-range goals.

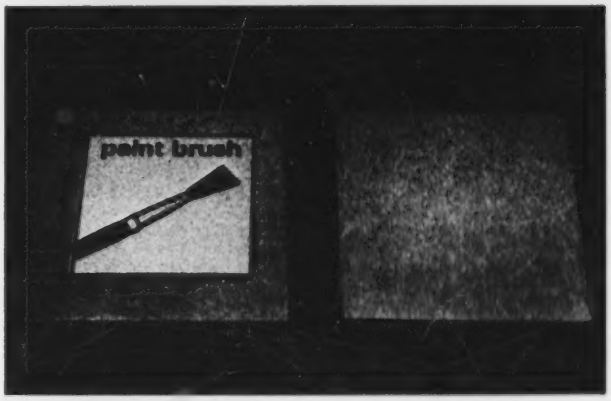
Short-Term Planning

Communication should be a constantly growing skill, but it is easy to let an individual plateau. Set acquisition criteria and keep data to determine when criteria are met. When a criterion (such as "Chooses correct symbol out of array of two symbols with 80% accuracy over four days, at least three trials per day") is met, change the procedure to assure a steady learning progression. Here are some changes that will promote steady progress, listed in the order in which you should apply them.

1. **Change the program.** The first place to make a change when a criterion is met is within the program. Such a change might involve:
   - The INDICATING RESPONSE (e.g., requiring a point instead of a touch)
   - The LEVEL OF ASSISTANCE that you offer (e.g., changing from a verbal plus point cue to simply a verbal cue)
   - A change in the TIME DELAY (e.g., changing from a 3-second to a 5-second delay)
   - GENERALIZATION (e.g., to a different trainer, time of day, or location)
   - A change in the targeted FUNCTION of symbolic communication (e.g., from a requesting function to a labeling function).
2. **Increase the vocabulary.** The next change you should make is to ADD NEW SYMBOLS as soon as the learner performs competently using the current vocabulary of symbols. Increase the learner's vocabulary as rapidly as possible, so the learner is able to communicate about as many aspects of the environment as possible.
3. **Increase the size of the array.** Gradually increase the number of distractor symbols in the array, as discussed earlier. The following substeps may be necessary to ensure that the learner is not randomly selecting symbols, but understands their meaning and uses them to communicate needs or desires.

   a. ***Nothing* Symbols.** Some individuals benefit from a move to a two-symbol array that consists of the targeted symbol plus a *nothing* symbol. The *nothing* symbol is an abstract shape or a blank picture card that is never associated with any referent. The learner gets nothing by choosing this symbol and the trial starts over again. This shows that it makes a difference which of two symbols is chosen, but the task is made easier because the learner has only to learn to avoid the *nothing* symbol. The learner learns to discriminate between symbols and how to use symbols to communicate a *choice*—in this case a choice between something and nothing.

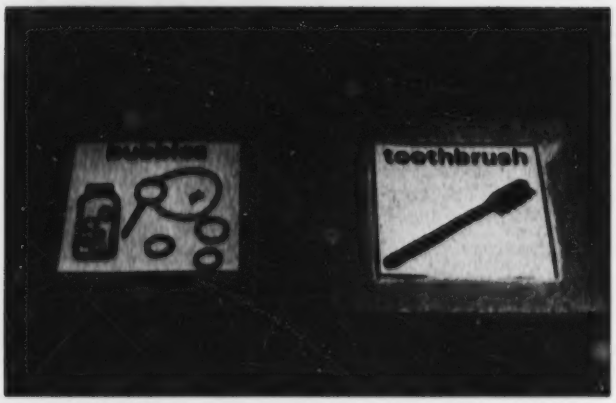
Three-dimensional symbol (left) and nothing symbol (right)



Two-dimensional symbol (left) and nothing symbol (right)

   b. **High- Versus Low-Preference Symbols.** A more difficult version of the two-symbol array presents one symbol for a highly preferred object and one for a nonpreferred object or activity. Now the individual must learn to discriminate between two real symbols, but the importance of the choice is heightened, since choosing the nonpreferred symbol is not nearly as pleasant as choosing the preferred one.

Here the choice is between symbols for roller-skating *(left) and a vocational task (right).*



Here the choice is between symbols for bubbles *(left) and* toothbrushing *(right).*

c. **Equally Preferred Symbols.** Once you are sure that the learner comprehends the symbols and the concept of communicating choices, switch to arrays of symbols for *equally* preferred items or activities.

4. **Change the Type of Symbol.** The last area for change is the type or level of representation of the symbol. You might experiment with this variable at first to determine the most appropriate level of representation to start with, but this should be the *last* variable to change after the initial probes. It is more important to train a learner to communicate as *competently* and as *spontaneously* as possible, with a *large vocabulary,* than to spend valuable time and energy trying to teach the use of more abstract symbols.

   Once an individual is ready to learn a new type of symbol, move to a level of representation that is more abstract, more conventional, and/or more portable. All of these qualifications make a symbol system more likely to be accepted and used by the people in the learner's environment. To make symbols more portable, make them smaller and/or place them on pages in a notebook that can be carried from activity to activity. If the meaning of a symbol is not immediately obvious, add a printed label so that anyone in the community can understand the symbols.

   Here is a series of symbols that one individual used for *hot dog.* The series progresses from a very concrete symbol to one that is more abstract, smaller, and more portable. The first symbol was a toy plastic hot dog. This was replaced by a thermoform impression of the hot dog shape, which was in turn replaced by a shallower thermoform impression of the same shape. The shallower symbols could be placed into a book of thermoform pages, each containing the imprint of several symbols.

A progression of symbols for hot dog.

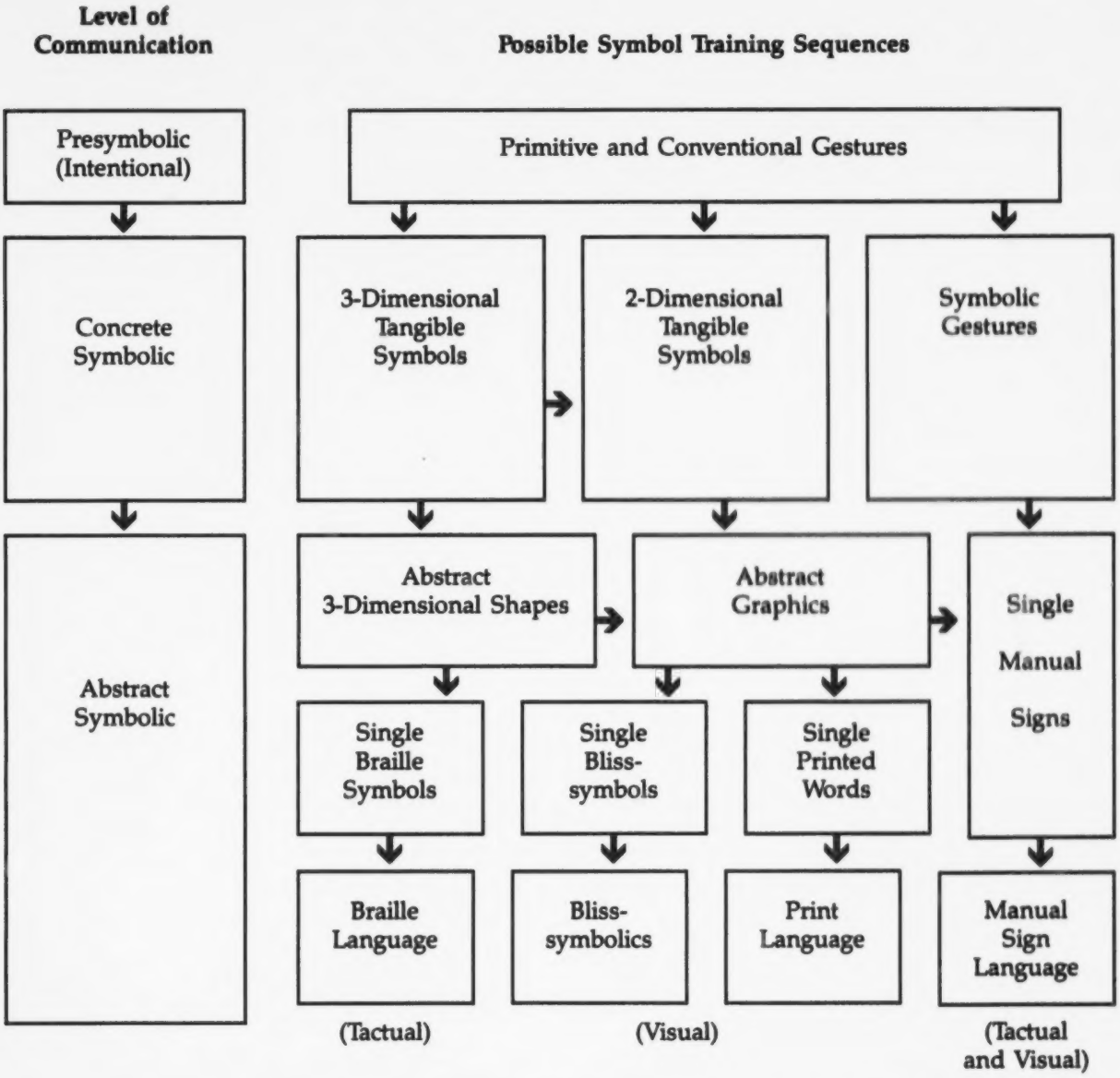
Long-Term Planning

Your goal should be to help a learner to move steadily toward more abstract symbolic communication. Some learners may never achieve the use of abstract symbols, and many will not follow the path that you plan for them. But a plan is needed.

The figure on the next page represents possible paths that a learner may take through three levels of communication (presymbolic, concrete symbolic, and abstract symbolic) via three alternative communication modes (three-dimensional symbols, two-dimensional symbols, and gestural communication). Moving toward the right across the chart, the symbol systems become more conventional and portable. Moving downward, the symbol systems become more abstract, and thus more conventional. The learner with functional vision has the potential to acquire all three modes of communication. The learner without sight will never use pictures to communicate, but may use three-dimensional symbols and possibly hand-in-hand manual signs or even Braille. Use the figure on the following page to guide long-term planning for individual learners.

Do not immediately abandon current modes of communication when an individual appears ready to use a more abstract mode. For instance, you may decide to train an individual who communicates competently using tangible symbols to use manual sign language. Pair the manual signs with tangible symbols that the individual has already acquired, or introduce a few manual signs for new vocabulary items. Use the two modes simultaneously for a period of time, with the goal of gradually replacing the tangible symbol vocabulary with manual signs. In some instances, however, two or more modes of communication may be used indefinitely, so the individual can communicate with as wide an audience as possible.

In Appendix C are three forms for planning and tracking individual student progress. The first form is a list of questions that you should review as you monitor student progress over time. Use the second form to track weekly or monthly progress in terms of the total number of symbols acquired, the type of symbol, and the type and number of distractors used. The third form is a vocabulary list for keeping track of the specific symbols and referents that an individual is learning or has learned to use.



APPENDIX A
Tangible Symbols Pretest

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Tangible Symbols Pretest

Purpose

Use the following forms to structure the information that will help you develop tangible symbol systems for specific students. The first form (Level of Representation Pretest) is for recording the learner's ability to match objects to various levels of representation of that object.

This form contains space to record performance on matching tasks involving zero to two distractors, in arrays of one to three items. It allows for the relevant number of unique arrangements of items (one arrangement for zero distractors, two arrangements for one distractor, and three arrangements for two distractors). Under each level of representation, three lines allow for testing across three different items (referents). Use the fourth line to calculate the percentage of correct responses.

Use the second form (Multi-Trial Probe Sheet) to record data if you need to perform in-depth probes. For instance, you might want to probe performance on a single type of symbol across multiple trials and multiple referents.

Order of Testing

The Levels of Representation Pretest is arranged in rough order from the most conventional and abstract types of symbolic representations to the most nonconventional and concrete types. Test in this order. There is no need to probe to lower levels of representation if a student succeeds in tasks involving two-dimensional symbols (photos, line drawings, abstract graphics). Keep in mind the sensory abilities of your students; there is no point in probing tasks that require vision if your student has no functional vision.

Format

The basic format is to present an array of items to the student and hold up the referent item to be matched. The item should be a motivating one. If the student responds correctly by somehow indicating the matching item, allow the student to manipulate the object. When the student responds incorrectly, show the correct response. Some students may have the ability you are probing, but may not understand the format of the task until you have demonstrated the correct response a few times.

Testing Materials

Assemble testing materials in advance. Use highly motivating materials, such as preferred foods and leisure items that the student desires. Allow the student to manipulate the selected item following a correct response, so that the student's response is a functional one that serves as a request.

Flexibility

These forms provide for only the most basic probes. To conduct a truly informative probe, you must be flexible and imaginative. When a student fails, experiment with the test format and record successes and failures. Keep notes on the format changes you make. The point is *not* to show what a student *cannot* do, but to probe for any level of success that would indicate a starting point from which to train the use of symbol systems.

Try these variations if the suggested formats do not work:

- Adjust the spacing of item array, moving items further apart or closer together.
- Use larger or smaller items.
- Experiment with the position of the array in relation to the student. Move items closer to or further away from the student. Adjust the height of the array. Move items to either side of the student to allow for visual field problems.
- Experiment with using highly nonpreferred distractors. Try using blank cards as distractors for photos or line drawings.
- Try holding up the *symbol*, rather than the referent, and have student select the matching referent from an *array of referents* rather than an array of symbols.

If the student succeeds with two distractors, probe larger numbers of distractors.

Additional Observations

Read the following questions *before* conducting this test and use your observations of the student's skills as shown in daily classroom activities, during other testing, and during your probes of format changes to answer as many questions as you can. Finish this section in as much detail as you can after completing the necessary testing.

Levels of Representation Pretest

Student_____

Tester_____

Date_____

1. **Level of representation.** What level of representation (type of symbol) is the student able to associate with items in the environment?
   - ____ Black-and-white line drawings
   - ____ Colored line drawings
   - ____ Photographs
   - ____ Symbols sharing only one or two features with referent
   - ____ Partial or associated objects
   - ____ Miniature/giant objects
   - ____ Identical objects

2. **Maximum size of array.** From how large an array is the student able to correctly select a symbol?

   If the student succeeded with two distractor symbols, did you probe for success with larger numbers of distractors? If so:

   What was the largest number of distractors probed? _____

   What was the largest number of distractors with which student performed successfully? _____

3. **Type of distractor items.** Are the distractors used equally familiar or of equal preference to the student? How does familiarity or preference affect student performance?

   Indicate if performance improved with any of the following types of distractors:
   - ____ Unfamiliar items
   - ____ Nonpreferred items (or symbols)
   - ____ Blank cards (for line drawings or photos)
   - ____ Objects placed on cards (as borders)
   - ____ Other (_____)

4. **Indicating or selecting response.** What is the predominant indicating response?
   - ____ Grasp and hold
   - ____ Extend to tester
   - ____ Extend to matching item
   - ____ Touch
   - ____ Point
   - ____ Eye gaze
   - ____ Other (_____)

5. **Scanning skills.** How good are the student's scanning skills in close visual field or, if appropriate, tactual field? Does student:
   - ____ Visually attend to array?
   - ____ Visually scan right-most of three items?
   - ____ Visually scan center of three items?
   - ____ Visually scan left-most of three items?
   - ____ Tactually explore array?
   - ____ Tactually scan right-most of three items?
   - ____ Tactually scan center of three items?
   - ____ Tactually scan left-most of three items?

If uncertain, analyze pretest data to determine the percent of correct responses for symbols placed in the left, right, or center position within the array. For example, if 80 percent of all correct responses occurred when the correct symbol was to the left in a three-symbol array, it is questionable whether the student is scanning to the right.

6. **Positioning of stimulus items.** Do your observations suggest an optimal position for stimulus items? Record any comments relevant to positioning, such as:
   - Optimal distance from student
   - Optimal height of array (from table, floor, or wheelchair tray)
   - Visual field limitations of student
   - Optimal spacing of stimulus items

For example, if the student had difficulty when symbols were placed flat on the table, did you then present them in a semi-upright position? Did performance change when array was moved closer to or farther from student? Should items in array be spaced closer together or farther apart?

_____

_____

_____

_____

7. **Size of items.** At first, test students using items that do not tax their perceptual skills. The first question to answer is whether the student comprehends the relationship between one type of item and another. Once you have established that a student does understand the association between, say, line drawings and objects, and that this is the highest level of representation available, experiment to see how small a line drawing the student is capable of discriminating.

   Specify the smallest size and type of item with which student succeeded (e.g., 2-inch square photographs). _____

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Levels of Representation Pretest

Student_____

Date_____ Tester_____

Type of Symbol (Level of Representation)	Referent Items	Array of Symbols (+ = symbol for *referent*; − = symbol for *distractor*) +−−	−+−	−−+	+−	−+	+	Distractors Used/Comments
Black-and-white line drawing	1							
	2							
	3							
	% correct							
Colored line drawing	1							
	2							
	3							
	% correct							
Photograph	1							
	2							
	3							
	% correct							
Symbol sharing only one or two features with referent (e.g., size, shape, color, texture)	1							
	2							
	3							
	% correct							
Partial or associated object (e.g., a *wheel* for a *toy car*)	1							
	2							
	3							
	% correct							
Miniature/giant object (e.g., a *doll's spoon* for a *real spoon*)	1							
	2							
	3							
	% correct							
Identical object	1							
	2							
	3							
	% correct							

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Multi-Trial Probe Sheet

Student _____

Date _____ Tester _____

Trial	Type of Symbol	Referent	Array										%	Distractors Used/ Comments
			+	− +	+ −	− − +	− + −	+ − −						
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														
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APPENDIX B
Blank Data Forms

Between-Activities Data Sheet

Student_____

Date_____ Tester_____

	Symbols														
1. INDICATE TERMINATION of activity Cue:_____ Response:_____															
2. ACCESS SYMBOL array Cue:_____ Response:_____															
3. STORE SYMBOL for terminated activity Cue:_____ Response:_____															
4. SELECT SYMBOL Cue:_____ Response:_____															
5. DISPLAY SYMBOL Cue:_____ Response:_____															
6. COMPREHEND SYMBOL Cue:_____ Response:_____															

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Within-Activities Data Sheet

Student _____

Activity _____

Date _____ Tester _____

STEP		SYMBOL															
TRIAL 1	SELECT																
	DISPLAY																
	COMPREHEND																
TRIAL 2	SELECT																
	DISPLAY																
	COMPREHEND																
TRIAL 3	SELECT																
	DISPLAY																
	COMPREHEND																
TRIAL 4	SELECT																
	DISPLAY																
	COMPREHEND																
TRIAL 5	SELECT																
	DISPLAY																
	COMPREHEND																

KEY SELECT symbol Cue _____

Response _____

DISPLAY symbol Cue _____

Response _____

COMPREHEND symbol Cue _____

Response _____

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APPENDIX C

Forms for Planning and Tracking Student Progress

On the next pages are forms for recording the learner's vocabulary of symbols and for tracking the learner's progress in using symbols. Use the data you collect to answer the following questions. Adjust the program accordingly.

Short-Term Planning Process

1. Has a criterion been met?

   If *yes*, are changes within the program needed in any of these areas?
   Indicating response
   Level of assistance
   Generalization
   Communicative function

   If criterion has not been met, consider these questions:

   Does the learner's level of representational understanding need further assessment?

   Is there a more motivating context for training (e.g., snack vs. work)?

2. Where can new vocabulary be trained, and what will that new vocabulary be?

3. Is it time to add distractor symbols to the array? If so, will they be:

   Equally preferred symbols?
   High- versus low-preference symbols?
   Nothing symbols?

4. Is the learner ready to move to more abstract symbols?

Tangible Symbols Progress Record

Student_____ School Year_____ Contexts_____

	September	October	November	December	January	February	March	April	May	June
Total Number of Symbols Acquired										
50+										
40-49										
30-39										
20-29										
15-19										
10-14										
8										
6										
4										
2										
0										
Type of Symbol										
Abstract Graphic										
Black-and-White Line Drawing										
Colored Line Drawing										
Photograph										
Abstract 3-Dimensional Object										
1 or 2 Shared Features										
Miniature/Giant Object										
Partial/Associated Object										
Identical Object										
Size of Symbol Array										
6+										
5										
4										
3										
2										
1										
Type of Distractor										
Equally Preferred										
Low-Preferred										
"Nothing" Symbol										

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Tangible Symbols Vocabulary List

Student_____

Symbols for Activities

Date	Symbol	Activity

Symbols for Individual Items, People, Concepts, etc.

Context:_____

Date	Symbol	Meaning

Context:_____

Date	Symbol	Meaning

Context:_____

Date	Symbol	Meaning

Context:_____

Date	Symbol	Meaning

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APPENDIX D
Results from the Tangible Symbols Project

Appendix D
Results from the Tangible Symbols Project

The strategies documented in this manual are the product of a two-year investigation of the use of tangible symbols by students with dual sensory impairments. The project involved assessment, intervention, and evaluation components. Intervention varied from student to student, depending upon the needs of the students and their teachers; it ranged from consultation with teachers and speech pathologists to the provision of direct training. All intervention programs embedded communication training within functional contexts, such as snack, leisure, or vocational activities. In no case was communication trained in isolated therapy sessions.

The data systems used to monitor student progress are described below, with summary data for each source. The use of objects as symbols is so novel that available communication assessment instruments do not accommodate it. Therefore, these instruments are extremely conservative measures of project impact. The direct skill acquisition data for individual students more accurately reflect the impact of the project.

Measures of Overall Development

The Wisconsin Behavior Rating Scale (Song et al. 1981) specifically gauges overall development in individuals with severe disabilities or deaf-blindness. The scale was administered on a yearly basis. The subscale that was expected to be most sensitive to project impact was the Expressive Language Subscale. Table 1 shows pre- and post-project scores for this subscale. The maximum possible score is 76.

TABLE 1

Expressive Language Subscale Score (WBRS)

	Pre	Post
C.B.	13	14
L.L.	11	22
C.L.	14	32
S.B.	10	30
B.R.	18	34
T.E.	23	24
A.W.	22	35
M.J.	9	24
J.T.	9	13

Measures of Communicative Development

The Callier-Azusa Scale-H (Stillman and Battle 1986) specifically evaluates communicative behavior in individuals with dual sensory impairments. The two subscales that were expected to be most sensitive to project impact were those entitled "Representational and Symbolic Development "and "Development of Intentional Communication." Tables 2 and 3 show pre- and post-project scores (total number of mastered plus emerging items) for each student. The total numbers of items on the two subscales are 63 and 35, respectively.

TABLE 2

Representational and Symbolic Development (Callier-H)

	Pre	Post
C.B.	17	20
L.L.	16	21
C.L.	28	31
S.B.	23	42
B.R.	35	41
T.E.	20	24
A.W.	26	39
M.J.	15	19
J.T.	15	13

TABLE 3

Development of Intentional Communication (Callier-H)

	Pre	Post
C.B.	16	16
L.L.	15	24
C.L.	29	30
S.B.	17	29
B.R.	27	29
T.E.	19	23
A.W.	21	27
M.J.	16	26
J.T.	12	20

Direct Measures of Student Progress

The most direct measure of communication skill acquisition is the number of tangible symbols that the students acquired over the course of the project.

This information appears in Table 4. The figures represent the number of symbols that were acquired either through direct training by project staff or through regular classroom instruction. Most students entered the project with no symbolic communication at all. At most, they unreliably used a small vocabulary of abstract symbols.

TABLE 4

Number of Tangible Symbols Acquired during Project Participation

C.B.	26
L.L.	22
C.L.	57
S.B.	84
B.R.	98
T.E.	22
A.W.	39
M.J.	24
J.T.	16

Another indicator of communicative competency is the size of the array from which the student is capable of selecting a symbol. Generally, separate arrays are used to display symbols for activities and symbols for materials used within activities. The array of activity symbols is usually a permanent one that the student accesses between activities. Usually, the teacher brings the symbol arrays for individual items to the activity area for use in specific programs. Table 5 shows gains in the size of the array of symbols for specific items or materials used for each student within activities.

TABLE 5

Size of Symbol Array (Within Activities)

	Pre	Post
C.B.	1	1
L.L.	1	3
C.L.	3	8+
S.B.	3	8+
B.R.	4	8+
T.E.	1	6
A.W.	3	4
M.J.	2	6
J.T.	1	3

For all students who received direct training from project staff, skill acquisition data were gathered on a daily basis. The most telling figures compiled from these data are the mean number of sessions that the students required to reach criterion on the acquisition of new symbols (sessions averaged three trials per symbol). Table 6 shows the mean number of sessions required by each student to acquire the first three symbols trained and the last three symbols trained. The dramatic drop in mean rate of acquisition for most students from the beginning to the end of project participation suggests that they had acquired a generic facility for learning new symbols.

TABLE 6

Mean Rate of Acquisition per Symbol
(Number of Training Sessions Conducted by Project Staff)

	First 3 Symbols	Last 3 Symbols
C.B.	15	9
L.L.	23	11
C.L.	no direct training	
S.B.	5	1
B.R.	16	1
T.E.	no direct training	
A.W.	7	4.8
M.J.	12	6
J.T.	16	13

In summary, most participants entered the Tangible Symbols project with no means of symbolic communication, and concluded the project with a viable communication system of manipulable objects or picture symbols. Some participants gained a small vocabulary of three-dimensional symbols; others gained a large vocabulary of three-dimensional symbols and then progressed to the use of two-dimensional symbols. Given the low overall level of functioning of the participants, the gains noted in direct training sessions were strong. Particularly heartening were experiences in a work activity center where two adults who had demonstrated no conventional means of communication learned very quickly to use tangible symbols to communicate their needs and desires.

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